

KARARA MINING LIMITED

Karara Corporate Standard

Environmental Plan – Flora and Vegetation Management Plan

CORP-EN-PLN-1011



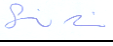
21-April-2022

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ENVIRONMENTAL PLAN – FLORA AND VEGETATION MANAGEMENT PLAN**

SYNOPSIS

This document presents the Flora and Vegetation Management Plan for Karara Mining Limited. The Plan is used to detail the methods, systems and strategies to be implemented for management of the document and data management functions.

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REV	DESCRIPTION	ORIG	REVIEW	APPROVER	DATE
0	Initial Issue	<u>J Russell</u>	<u>R Houlihan</u>	<u>M Todd</u>	22-Jun-12
1	Reissued for use	 <u>J Russell</u>	 <u>M Chen</u>	 <u>G Trench</u>	21-Apr-22

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1 INTRODUCTION

1.1 Purpose

This Flora and Vegetation Environmental Management Plan (Flora and Vegetation EMP) has been prepared to address, in a coordinated manner, the regional and site specific flora and vegetation management requirements resulting from mining, processing, stockpiling, handling and transporting of iron ore product. Specifically, it addresses the following:

- The Legislative requirements and commitments made during the Public Environmental Review process for the Karara Iron Ore Project (KIOP), the Mungada Iron Ore Project (MIOP) and all associated infrastructure.
- The Ministerial Statements 805 and 806 pertaining to KIOP and MIOP approval.
- Conditions outlined in Mining Proposals approved by the Department of Mines, Industry Regulation and Safety.
- Karara Mining Limited's (KML) objectives regarding avoiding, minimising, mitigating and monitoring impacts to flora and vegetation.

It should be noted that this Flora and Vegetation EMP relates to the following projects and work packages:

- KIOP: Karara mining activities and associated infrastructure i.e. Karara - Tilley Siding Rail Project, Karara – Eneabba Power Project, Karara – Yandanooka Raw Water Project, Mungada Road Upgrade works, Karara processing plant construction works and any other associated infrastructure works; and
- MIOP: Blue Hills North, Terapod West, Terapod North and any other associated infrastructure works.

1.2 Legislation

The relevant Commonwealth and State legislation to this Flora and Vegetation MP has been summarised in Table 1-1.

Table 1-1: Commonwealth / State legislation relevant to the Flora and Vegetation EMP

Legislation	Relevance	Regulatory Authority
<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>	Protection on environmental matters of national significance.	Department of Agriculture Water and the Environment
<i>Conservation and Land Management Act 1984 (WA)</i>	Protection and management of nature reserves, state forest, marine parks etc.	Department of Biodiversity Conservation and Attractions

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Legislation	Relevance	Regulatory Authority
<i>Environmental Protection Act 1986 (WA)</i>	Prevention, control and abatement of pollution and conservation protection and enhancement of the environment.	Department of Biodiversity Conservation and Attractions
<i>Mining Act 1978 (WA)</i>	Regulation of environmental issues associated with mining, including environmental bonds.	Department of Mines, Industry Regulation and Safety
<i>Biodiversity Conservation Act 2016 (WA)</i>	Provides for the conservation and protection of wildlife (flora and fauna). Special provisions and schedules cover protection and management of gazetted rare flora and fauna.	Department of Biodiversity Conservation and Attractions
<i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA)</i>	Clearing of native vegetation	Department of Mines, Industry Regulation and Safety and the Department of Water and Environmental Regulation
<i>Agriculture and Related Resources Protection Act 1976 (WA)</i>	Covers management of weeds with potential to impact agricultural production.	Department of Primary Industries and Regional Development

2 DEFINITIONS

Term	Definition
KML	Karara Mining Limited
EMP	Environmental Management Plan
KIOP	Karara Iron Ore Project
MIOP	Mungada Iron Ore Project
IBRA	Interim Biogeographic Regionalism for Australia
DBCA	Department of Biodiversity Conservation and Attractions
DWER	Department of Water and Environmental Regulation
DRF	Declared Rare Flora
P1	Priority 1
P2	Priority 2
P3	Priority 3
LIC	Linear Infrastructure Corridor
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
TEC	Threatened Ecological Community
PEC	Priority Ecological Community
TSF	Tailings Storage Facility
ROM Pad	Run of Mine Pad
BIF	Banded Iron Formation
KMA	Key Management Action
DMIRS	Department of Mines, Industry Regulation and Safety

3 CONTEXT

This section describes the existing flora and vegetation values found within the KIOP and MIOP and linear infrastructure project areas:

- KIOP includes the Karara mine site and associated mining infrastructure.
- MIOP Includes the Blue Hills and Terapod.
- Linear Infrastructure includes rail, raw water pipeline and powerline corridor associate with the mining project.

The information is based on field surveys undertaken by Woodman Environmental Consulting.

Survey results are kept on KML GIS database. Survey reports are located in KML's electronic library.

3.1 Biogeographic setting

The project is located within the Yalgoo Bioregion of the Interim Biogeographic Regionalism for Australia (IBRA) classification system. This region is described as an interzone between the South-Western and Murchison bioregions, characterised by low woodlands to open woodlands of *Eucalyptus*, *Acacia* and *Callitris* on red sandy plains of the Western Yilgarn Craton and southern Carnarvon basin.

The IBRA system is also closely related to the classification developed by Beard (Beard 1990). Beard's system describes the project area as being in the Yalgoo sub-region of the Austin Botanical District, within the Murchison Botanical region.

The Austin Botanical District is characterised by a predominately Mulga (*Acacia aneura*) low woodland on plains, reduced to scrub on hills, with a tree steppe of *Eucalyptus spp.* on sand plains. The Yalgoo sub-region is distinctive as it is a transitional area between the Mulga areas and the southwest region and is dominated by a variety of *Acacia* species.

The vegetation of the mine site is generally in good condition. Past pastoral practices are evident in some areas, where several relatively large, discrete areas have been over-grazed and have not yet started to regenerate.

The vegetation of the eastern section of the rail line is largely in very good condition, however several areas have been disturbed or degraded due to clearing and grazing. The western end of the rail line has been previously impacted to a large extent by clearing for agriculture, and related activities.

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The eastern portion of the linear infrastructure corridor (approximately 34 km) passes through relatively intact vegetation of good quality on former pastoral stations, currently owned by DBCA. This section of the route runs parallel to the access road (Mungada Road at this location) and consists of 11 different structural vegetation communities plus an additional four degraded or disturbed communities. This vegetation comprises intact thickets, scrubs and low woodlands, as well as several areas that are degraded due to grazing, gravel extraction and other minor historical clearing. The western portion of the corridor (approximately 100 km), from where it deviates from the access road to Mingenew, passes through cleared agricultural land with widely dispersed patches of good quality, intact vegetation. This section of the route consists of 18 different structural vegetation communities plus an additional eighteen degraded or disturbed communities. This vegetation comprises thickets, shrubs, woodlands, dwarf scrubs and salt pan communities. The route passes around the boundary of the Bowgada Nature Reserve.

The eastern portion of the proposed access road, along Mungada Road, passes through relatively intact; good quality vegetation on former pastoral stations, currently owned by DBCA, however, there are several areas that are degraded due to grazing, gravel extraction and minor historical clearing. In the agricultural areas surrounding Morawa, the route mainly passes through cleared paddocks with some, usually degraded, remnant patches of native vegetation, often occurring in thin strips along the road verge.

3.2 Flora

3.2.1 KIOP/MIOP survey areas

A total of 514 plant taxa were identified within the KIOP / MIOP survey area with 202 genera from 72 families represented. This is a combination of data from several surveys by different surveyors, over separate seasons and years.

A total of 25 conservation significant flora species have been surveyed and recorded within the KIOP / MIOP survey area (Table 3-1). These include Declared Rare Flora (DRF) and priority flora species.

Table 3-1: Flora species of conservation significance within the mine site and associated infrastructure survey areas

Species of interest	Conservation status
<i>Acacia karinae</i>	P1
<i>Acacia woodmaniorum</i>	DRF
<i>Austrostipa blackii</i>	P3
<i>Baeckea</i> sp. Perenjori (J. W. Green 1516)	P2
<i>Calandrinia kalanniensis</i> ms	P2
<i>Calotis</i> sp. Perrinvale Station (R.J. Cranfield 7096)	P3
<i>Chamelaucium</i> sp. Yalgoo (Y. Chadwick 1916)	P1

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Species of interest	Conservation status
<i>Drummondita fulva</i>	P3
<i>Grevillea globosa</i>	P3
<i>Grevillea scabrida</i>	P3
<i>Grevillea subtiliflora</i>	P3
<i>Gunniopsis divisa</i>	P3
<i>Lepidosperma</i> sp. Blue Hills (A.Markey & S.Dillon 3468)	P1
<i>Melaleuca barlowii</i>	P3
<i>Micromyrtus acuta</i>	P3
<i>Micromyrtus trudgenii</i>	P3
<i>Millotia dimorpha</i>	P1
<i>Persoonia pentasticha</i>	P3
<i>Pityrodia viscid</i>	P4
<i>Polianthion collinum</i>	P3
<i>Rhodanthe collina</i>	P3
<i>Stenanthemum poicilum</i>	P3
<i>Stylidium scintillans</i>	DRF
<i>Petrophile pauciflora</i>	P3
<i>Tecticornia bulbosa</i>	DRF

There are five significant flora species on which the project will have a medium - high direct impact, these include; *Stylidium* sp. Yalgoo, *Acacia woodmaniorum*, *Millotia dimorpha*, *Acacia karinae* and *Lepidosperma* sp. Blue Hills.

Stylidium scintillans (DRF) is a perennial herb that has a restricted distribution to the Terapod mining area (MIOP).

Acacia Woodmaniorum (DRF) is an intricately branched, prickly, hard shrub, to 2 metres high. It's found on the banded ironstone formations of Mungada and Terapod Ridges.

Millotia dimorpha (P1) is an erect or ascending annual, herb, to 0.11 m high, found within the red loamy soils in various areas within the project area.

Acacia karinae (P1) is a perennial shrub or small tree that has a restricted distribution and is currently only known from the Karara mine site area and surrounds and from a single recording at Mt Gibson.

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Lepidosperma sp. Blue Hills (P1) is a perennial, sedge species that has a restricted distribution and is currently only known from within a 10 km radius of the Karara mine site area.

A total of 26 weed plant taxa have been recorded within the KIOP/MIOP survey area. Most of these weed species are relatively non-invasive, annual species that have been introduced via the grazing of stock (prior to de-stocking of Karara Station) and feral animals, or by mechanical means. There is generally very low weed cover throughout the entire mine site area.

Two of the recorded weeds are listed under the *Agriculture and Related Resources Protection Act 1976*. *Echium plantagineum* (Paterson's Curse or Salvation Jane) is listed as a P1 Declared Plant for the whole of the State. *Galium aparine* (cleavers or goosegrass) is listed as a P1/P2 Declared Plant for the whole of the State, which requires eradication of known populations and prevention of spread of seed and plant parts through machinery, livestock, fodder, grain, and vehicles. Refer to KML's Weed and Plant Pathogen Management Plan for more information.

3.2.2 Linear Infrastructure - Rail

The rail alignment and adjacent areas were surveyed by Woodman Environmental Consulting in Spring 2008 (the Rail survey area). The width of the rail survey area was approximately 200m either side of the rail centreline.

A total of 348 plant taxa have been recorded during the survey. One Declared Rare Flora (DRF) and seven priority flora taxa were recorded within the rail survey area (Table 3-1).

A population of the DRF *Tecticornia bulbosa*, comprising of approximately 47,730 individuals, was found inside the survey area.

A total of five individuals of *Santalum spicatum* (Sandalwood) were recorded opportunistically within the survey area. This species is protected under the *Sandalwood Act 1929*. Clearing of this species from Crown land is prohibited, except under a licence pursuant to the Act.

Seventeen weed species were identified in the rail survey area, including Paterson's Curse, a P1 Declared Plant.

3.2.3 Linear Infrastructure – Raw Water Pipeline

Woodman Environmental assessed the vegetation and flora values of the proposed Linear Infrastructure Corridor (LIC) over three surveys, in October 2006, May 2007 and July 2007. This assessment included an initial desktop assessment and literature review.

A distance of 50m either side of the centre line of the LIC route was surveyed for its entire length.

The flora and vegetation survey of the eastern portion of the LIC identified 206 vascular plant taxa while the survey of the western portion identified 244 taxa. This includes plant species from 124 genera and 52 families.

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The literature review and database search identified one DRF and 15 Priority Flora known to occur within 2 km of the corridor route. Flora and vegetation surveys recorded five of these species within the corridor survey area, see Table 3-1.

There were seven introduced flora taxa identified in the eastern portion of the corridor and 14 introduced flora taxa identified in the western portion. These species include two Declared Plants under the *Agriculture and Related Resources Act 1976*, Paterson's Curse (*Echium plantagineum*) and Saffron Thistle (*Carthamus lanatus*).

3.2.4 Linear infrastructure - Access Road

Woodman Environmental assessed the vegetation and flora values of the proposed access road over three survey periods, in November 2005, November 2006 and February 2007. Surveys were undertaken along the entire length of the proposed access road from the minesite to the intersection with Morawa Road, 3 km north of Morawa, and at five proposed borrow pits along the route. A distance of 50m either side of the existing access road was surveyed, utilising the same methods that were applied in the surveying of the minesite.

The Woodman Environmental flora and vegetation survey of the access road recorded a total of 285 discrete vascular plant species (from 129 genera and 51 families). Flora species of conservation significance identified within the proposed access route survey area are listed in Table 2-1.

The DRF species, *Tecticornia bulbosa*, was recorded adjacent to Munckton Road, as part of a previously recorded population. This species is listed as Vulnerable under both the *State Wildlife Conservation Act 1950*, and the Commonwealth EPBC Act. This population of *T. bulbosa* is under threat from grazing and changes to surface water drainage.

There are ten weed species identified along the route, none of which are listed under the *Agriculture and Related Resources Protection Act 1976*. Paterson's Curse was not identified during the survey however it is likely to occur in the area.

3.3 Vegetation Community Types

3.3.1 KIOP / MIOP Survey Area

There are three, broad groups of vegetation (Super Groups) within the survey area that are clustered by the broad, physical processes that help to shape each plant community. Super Groups have been further divided into 23 Floristic Community Types (FCTs), which have been grouped based on statistical similarities in species diversity. These FCTs are shown in Figure 3.1.

- Super Group 1. Woodlands and shrublands in depressions, saline flats, flats and lower slopes on predominantly silty-loam soils (FCTs 1-7).
- Super Group 2. Woodlands and shrublands on lower slopes to crests on rocky BIF or granite substrates (FCTs 8-14).
- Super Group 3. Shrublands with occasional emergent Eucalyptus spp. on flats to mid slopes on clay-loams with ironstone gravels (FCTs 15-27)

The conservation significance for each FCT is shown in Figure 3.2.

In general, FCTs from Super Groups 1 and 3 were given lower rankings of conservation significance than those from Super Group 2. This is primarily due to the wider distribution of soil types and habitats preferred by the FCTs from Super Groups 1 and 3 and because there are fewer priority species in these FCTs.

Of particular significance to the survey area are FCTs 13 and 14. These FCTs are restricted to the BIF ridges of the Karara and Mungada areas.

None of the FCTs at the mine site are currently listed as Threatened Ecological Communities (TECs).

A Priority 1 Priority Ecological Community (PEC) (current as of January 2008) exists within the KIOP / MIOP survey area. This PEC is called “Blue Hills (Mt Karara, Mungada Ridge and Blue Hills) vegetation complex (banded ironstone formation)” and includes all vegetation associated with the BIF within the Mt Karara – Windanning Hill area including blue Hills and Terapod, as described by Markey and Dillon (2006). The PEC corresponds to the following FCTs: 8, 9, 10a, 10b, 11, 12, 13, 14 and mosaic 11/9. Refer to Figure 3.3 for the location of the PEC.

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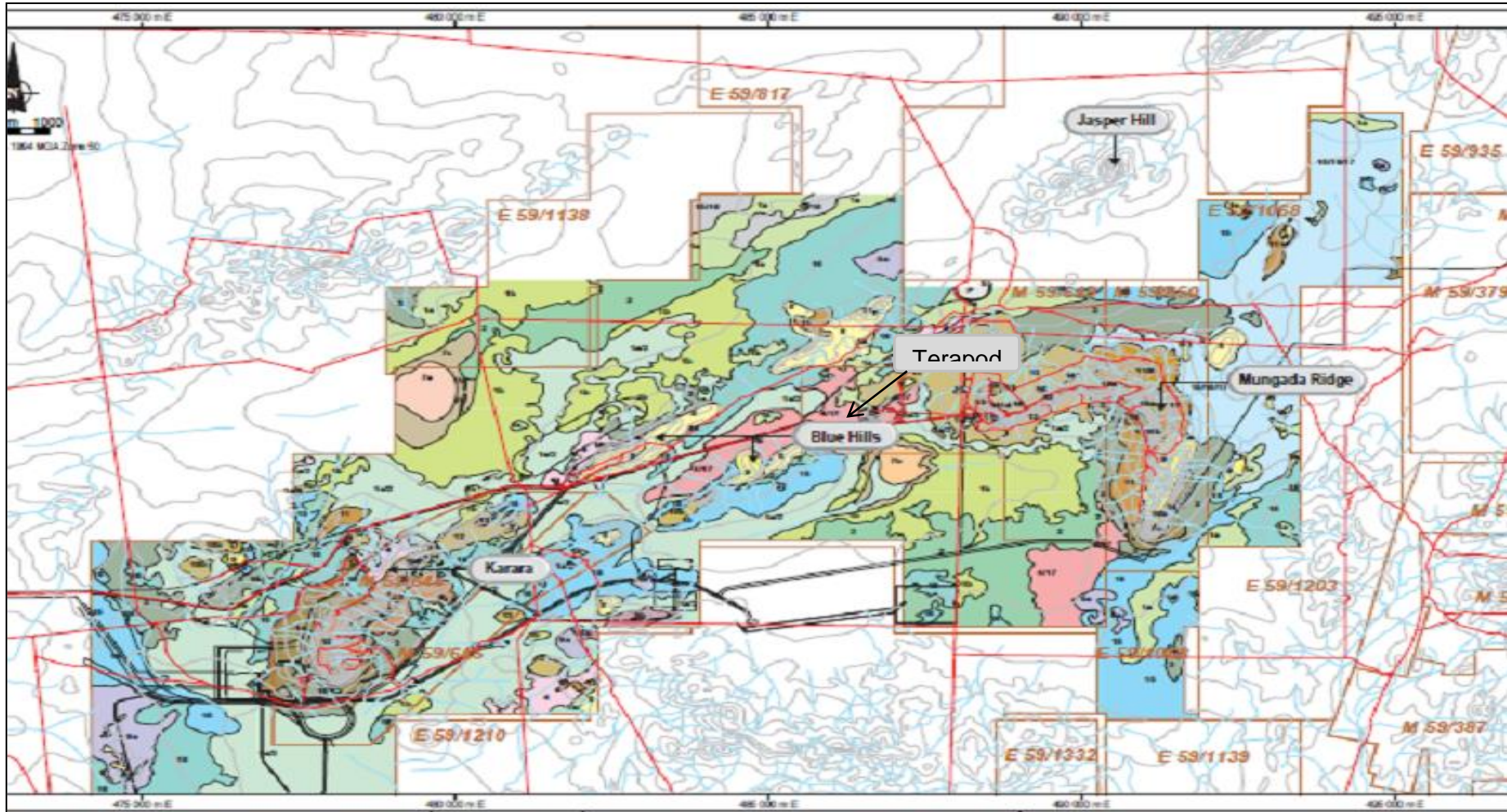


Figure 3.1: Floristic Community Types

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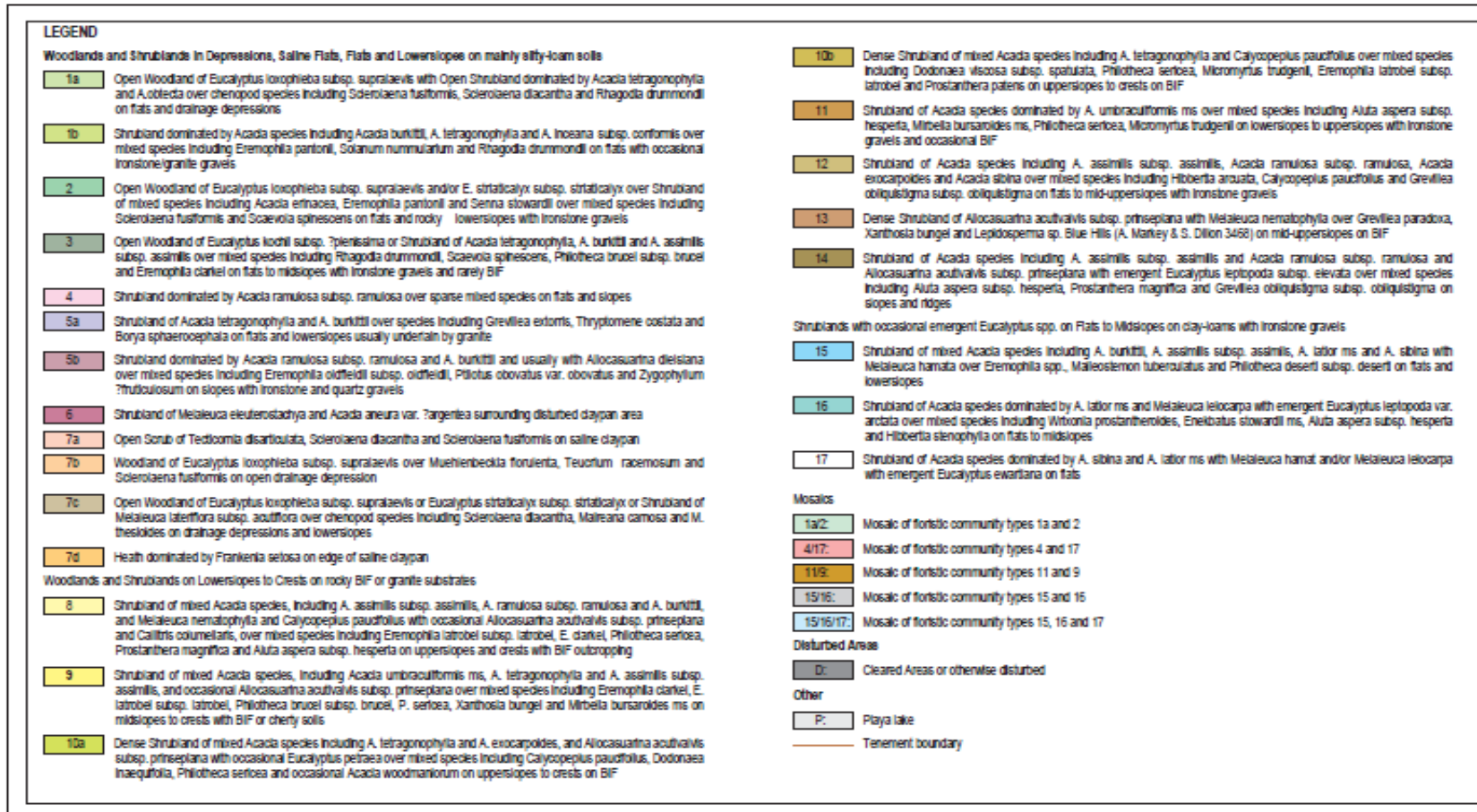


Figure 3.1 (cont.): Floristic Community Types Legend

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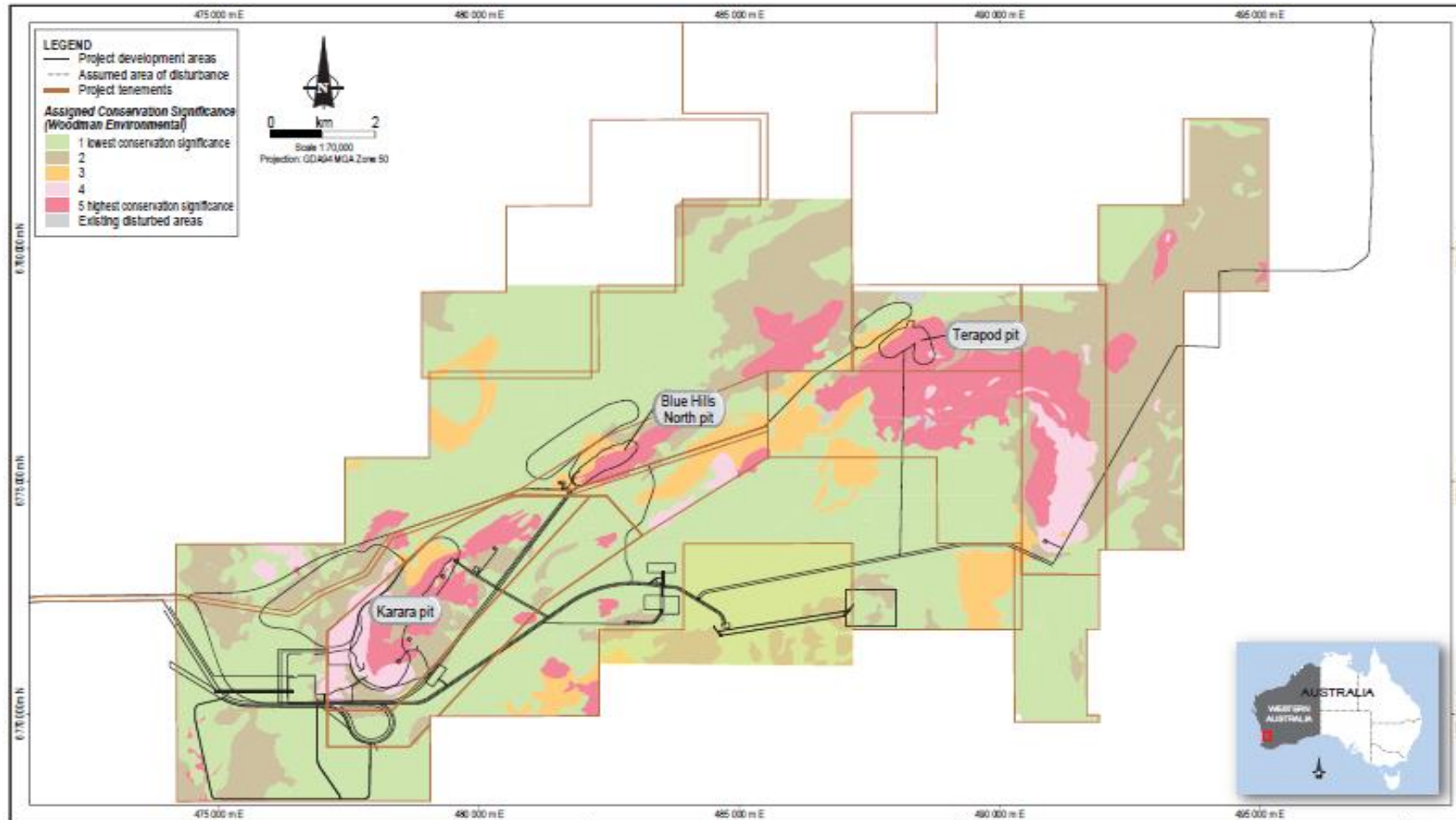


Figure 3.2: Conservation Significance of Floristic Community Types

3.3.2 Linear Infrastructure - Rail

The rail line crosses a total of 10 vegetation associations, which are further split into 20 vegetation sub-associations. Of these vegetation associations, two have less than 30% of their pre-European extent currently remaining. The two vegetation associations that have less than 30% of their pre-European extent are:

- 352 – Medium woodland; York gum 15.2%; and
- 551 – Shrublands; *Allocasuarina campestris* thicket 24.2%.

3.3.3 Linear Infrastructure – Raw Water Pipeline

There are three TECs known to occur within 5 km of the proposed route, none of which occur within the corridor or are listed on the EPBC Act:

- Billeranga System. This system was mapped by Beard (Beard 1976) between the Old Three Springs Road and Colgate Road, approximately 15 km southwest of Morawa. Five occurrences of this TEC are known; however all but one occurrence is on private property and 85 ha of this TEC is currently within the conservation estate (Mount Nunn Nature Reserve). There are seven Priority Flora known from the Billeranga System (Hamilton-Brown 2000a). This TEC is listed as vulnerable.
- Koolanooka Hills System. This system was mapped by Beard (Beard 1976) and is located adjacent to Lochada Road, approximately 25 km east of Morawa and near the Bowgada Nature Reserve. The Koolanooka Hills System is known from two chains of hills, the Koolanooka Hills situated east of Morawa, and a separate fork shaped range situated to the south-east of the Koolanooka Hills. The known occurrences of the Koolanooka Hills System are currently under private ownership, leasehold or in shire reserves, with none reserved in the conservation estate. This TEC is listed as vulnerable.
- Morilla Swamp. This system is known from only one location, approximately 28 km east of Mingenew. This TEC is a small swamp, approximately 600 m in diameter, known to contain an isolated, potentially genetically unique population of River Red Gums (*Eucalyptus camaldulensis*) (Speed et al 1994). The Morilla Swamp is currently not included within the conservation estate. This TEC is listed as presumed totally destroyed.

3.3.4 Linear Infrastructure - Access Road

The access road route consists of 23 different structural vegetation communities plus an additional nine degraded or disturbed communities. These include thickets, scrubs, woodlands and dwarf scrubs.

The eastern portion of the proposed access road, along Mungada Road, passes through relatively intact; good quality vegetation on former pastoral stations, currently owned by DEC, however, there are several areas that are degraded due to grazing, gravel extraction and minor historical clearing. In the agricultural areas surrounding Morawa, the route mainly passes through cleared paddocks with some, usually degraded, remnant patches of native vegetation, often occurring in thin strips along the road verge.

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There is a sizeable portion of remnant native vegetation on private property, along Koolanooka Spring Road, however this has been degraded by stock grazing. This area is part of TEC 59 (Plant Assemblages of the Koolanooka System), which has a Vulnerable listing at a State level but is not listed under the Commonwealth EPBC Act. The TEC ranges over the Koolanooka Hills, surrounding footslopes, and the fork-shaped range to the south-east, referred to as the Perenjori Hills, covering a total area of approximately 3,496 ha (Hamilton-Brown 2000b). Woodman Environmental mapped four different structural vegetation communities along this portion of the route (T27, T28, T29 and W18) with vegetation dominated by thickets or scrubs mainly of *Acacia* species (including *A. acuminata*, *A. duriscula*, *A. tetragonophylla* and *A. quadrimarginea*), interspersed with open, low woodlands dominated by *Eucalyptus ebbanoensis* subsp. *Ebbanoensis*.

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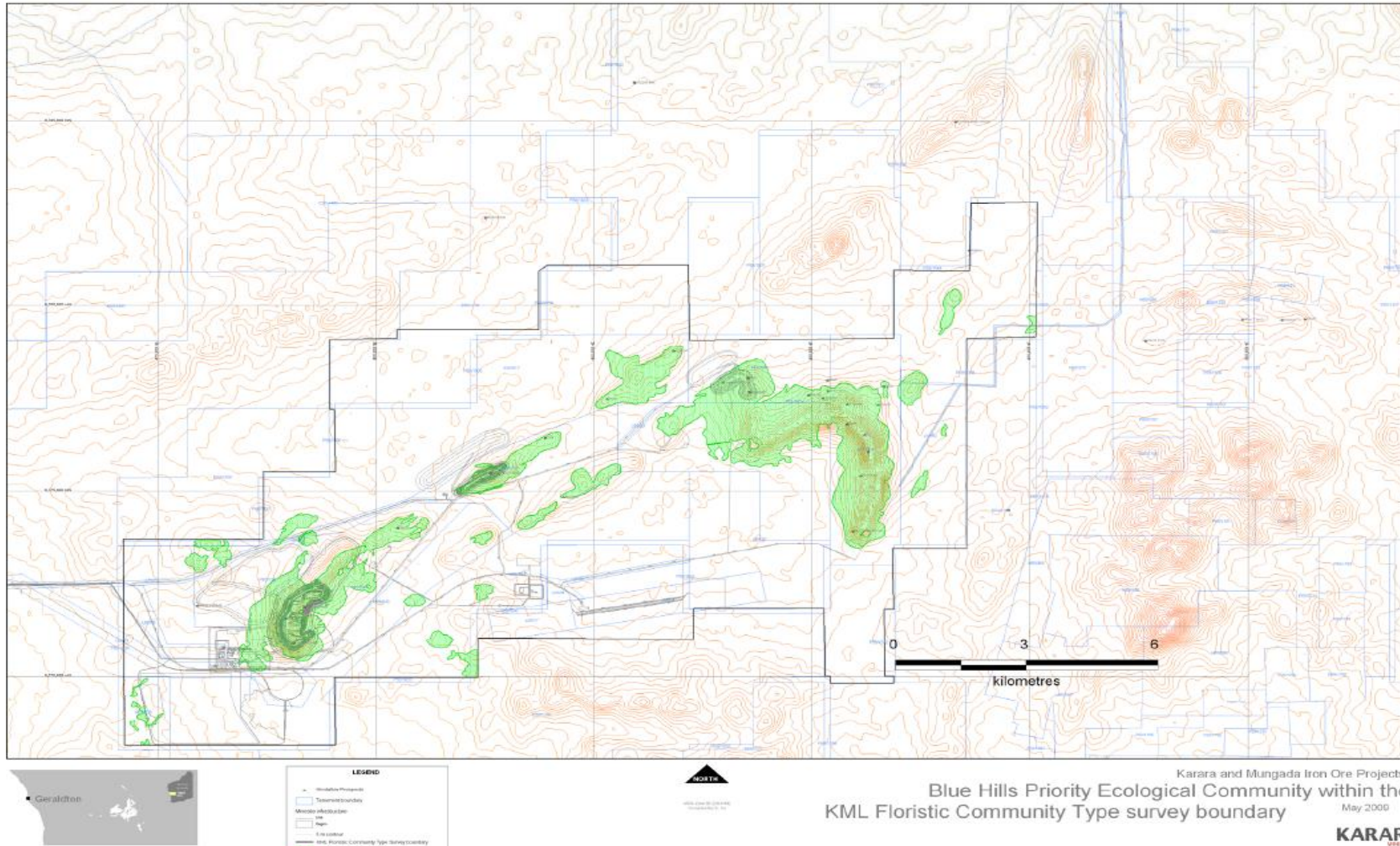


Figure 3.3 Blue Hills Priority Ecological Community within the KIOP/MIOP Floristic Community Type survey area

4 POTENTIAL IMPACTS

The following section describes the threats or processes that can potentially have a significant impact on flora and vegetation. The risks of these impacts occurring are detailed in KML's Aspects and Impacts Register. The management measures to prevent these impacts are discussed in Section 5.

4.1 Ground Disturbance

The primary potential impact to flora species and vegetation types for the project will be ground disturbance during construction and mining. Table 3-1 presents the initial clearing required for various project components.

Table 4-1: Clearing requirements for Karara Mine Site and Associated Infrastructure

Project Component	Clearing Required
Karara Iron Ore Project	1,472 ha
Common disturbance	318 ha
Mungada Iron Ore Project	292.98 ha
Raw water pipeline Corridor	405 ha (107 ha of remnant native vegetation)
Access Road/Haul Road (minesite to Morawa)	254 ha (93 ha of remnant native vegetation)
Tilley East rail siding	111 ha
Rail	768 ha (422 ha of remnant native vegetation)
Total	3,621 ha

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Ground disturbance represents a direct impact to flora and vegetation communities. There are opportunities through ground disturbance, however, to harvest seeds, vegetation and topsoil for use in rehabilitation.

The percentage of impacts by area (ha) to FCTs and local and regional impact to flora species of conservation significance have been calculated by Woodman Consulting and are presented in Table 3-2 and Table 3-3 respectively.

A 50 m buffer around the pit, waste rock dump and dry-stacked TSF has been included in the total disturbance area to account for potential indirect impacts. Calculations have conservatively assumed that all vegetation within this buffer will be effectively cleared by the project. Further, qualitative discussion on potential indirect impacts outside of this direct disturbance area is provided below.

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Table 4-2: Impacts of the Karara Footprint on Floristic Community Types

FCT	Conservation Significance Ranking ¹	Total Area Mapped (ha)	Proposed Disturbance (ha)	Proposed Disturbance (% of Total Area mapped)
1a	1	795.1	77.1	9.7%
1b	1	1,577.4	36.0	2.3%
2	1	1,262.94	92.5	7.3%
3	2	932.5	108.5	11.6%
4	4	256.1	88.5	34.6%
5a	1	292.1	104.6	35.8%
5b	2	142.7	1.7	1.2%
6	1	5.4	1.8	33.9%
7a	1	93.3	0.0	0.0%
7b	3	54.3	0.0	0.0%
7c	3	173.4	0.0	0.0%
7d	1	3.2	0.0	0.0%
8	5	385.9	51.0	13.2%
9	4	150.4	0.8	0.5%
10a	4	10.0	1.5	15.4%
10b	4	80.9	0.0	0.0%
11	5	218.7	0.9	0.4%
12	5	642.3	40.6	6.3%
13	5	258.1	139.2	53.9%
14	4	324.1	210.6	65.0%
15	1	1,394.0	83.8	6.0%
16	2	1,512.1	370.0	24.5%
1a/2	1	3,482.7	606.2	17.4%
4/17	4	469.2	7.3	1.6%
11/9	5	124.2	0.0	0.0%
15/16	2	105.9	0.0	0.0%
15/16/17	2	1,261.8	0.0	0.0%
Playa Lake	1	11.3	6.7	23.0%
Disturbed	-	29.3	0.0	0.0%
Total	-	16,049.34	2,029.3	10.7%

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Note: The predicted impact for FCT 17 is not given as FCT 17 occurs only as a mosaic with FCT 4 or with FCT 15 and FCT 16. Predicted impacts for these mosaics are supplied.

¹ Where 1 indicates lowest and 5 indicates highest.

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Table 4-3: Impacts of the KIOP / MIOP and Associated Infrastructure Footprint on Flora Species of Conservation Significance

Species of interest	Conservation Status	Impact	
		Local	Regional
<i>Acacia karinae</i>	P1	High	Mod-High
<i>Acacia woodmaniorum</i>	DRF	High	Moderate
<i>Austrostipa blackii</i>	P3	No impact	No impact
<i>Baekea sp. Perenjori</i> (J.W. Green 1516)	P2	Low	Low
<i>Calandrinia kalanniensis ms</i>	P2	No impact	No impact
<i>Calotis sp. Perrinvale Station</i> (R.J. Cranfield 7096)	P3	Low	Low
<i>Chamelaucium sp. Yalgoo</i> (Y. Chadwick 1916)	P1	No impact	No impact
<i>Drummondita fulva</i>	P3	Moderate	Low
<i>Grevillea globosa</i>	P3	Low	Low
<i>Grevillea scabrada</i>	P3	No impact	No impact
<i>Grevillea subtiliflora</i>	P3	No impact	No impact
<i>Gunniopsis divisa</i>	P3	No impact	No impact
<i>Hydrocotyle dimorphocarpa</i>	P1	No impact	No impact
<i>Lepidosperma ?sp. Blue Hills</i> (A.Markey & S. Dillon 3468)	P1	Moderate	Moderate
<i>Melaleuca barlowii</i>	P3	Low	Low
<i>Micromyrtus acuta</i>	P3	Low	Low
<i>Micromyrtus trudgenii</i>	P3	Low	Low
<i>Millotia dimorpha</i>	P1	High	Mod-High
<i>Persoonia pentasticha</i>	P3	Moderate	Low
<i>Pityrodia viscid</i>	P4	Low	Low
<i>Polianthion collinum</i>	P3	Low	Low
<i>Rhodanthe collina</i>	P3	Low	Low
<i>Stenanthemum poicilum</i>	P3	No impact	No impact

Species of interest	Conservation Status	Impact	
		Local	Regional
<i>Stylidium scintillans</i>	DRF	Moderate	Moderate
<i>Petrophile pauciflora</i>	P3	Low	Low
<i>Tecticornia bulbosa</i>	DRF	Low	Low

4.2 Altered Hydrology

Alterations to surface water runoff (either a reduction or increase in the amount of water) can potentially affect native vegetation. A drainage shadow may form down slope of any built feature or infrastructure. This is where water that would have run directly down slope is diverted around the infrastructure, forming a 'shadow' down slope of the infrastructure where water no longer runs. Any vegetation in this area is therefore deprived of water, which may result in reduced plant health and possible plant mortality.

Areas of drainage accumulation may form where water diverted by buildings or infrastructure concentrates in a relatively small area, water logging soils and potentially drowning vegetation.

Linear infrastructure, such as the rail, roads, above-ground pipes and the airstrip, are most likely to cause a significant drainage shadow, if drainage controls are not properly installed and managed.

Wet TSF storage dams have the potential to cause localised inundation and ground water mounding, affecting plant communities in the immediate vicinity through water logging and saline water impacts.

4.3 Groundwater drawdown

Pit dewatering and other groundwater abstraction will cause the groundwater table in the vicinity to draw down. The depth and the rate of any drawdown will determine the effect that this has on flora and vegetation. Groundwater drawdown will only affect those plants whose roots reach the water table and that rely on groundwater as a primary water source.

4.4 Dust Deposition

Excessive dust deposition on vegetation may lead to reduced plant health from physical effects (e.g., dust blocking light from the leaves, blocking stomata and preventing gas exchange, and making plants less attractive to pollinators) or chemical effects (e.g., changes to soil chemistry).

Wheel generated dust from haul trucks and general traffic is predicted to be the greatest source of dust, followed by mining (including blasting), materials handling, both in pit and at the ROM Pad and waste rock dumps, and wind entrainment of fine particles from the waste rock dumps and TSF.

4.5 Dust Suppression Water Overspray

The application of excessively saline water to construction and operational areas has the potential to reduce the health of adjacent flora and vegetation if effective management measures are not put in place. Further, overspray of water under high temperature conditions may burn vegetation and flora.

4.6 Fire

While Australian native flora is often adapted to, and in some cases, depends on fire, significant changes in fire regimes may result in vegetation being burnt too frequently or not often enough. Either scenario can lead to a reduction in plant health or mortality of plants.

4.7 Weeds

Weeds, if they become established, become direct competition for native plants, potentially smothering their growth or using scarce water and nutrient resources. This may reduce the number of conservation significant flora species or degrade FCTs of conservation significance.

Weeds also do not provide the same ecosystem services that native plants do, for example, they do not bind the soil as native plants do, leading to erosion, and they may not provide suitable habitat or food resources for fauna. Once established, weeds are extremely difficult to eradicate.

4.8 Feral Animals

Feral animals, particularly goats and rabbits, can put immense pressure on flora and vegetation through excessive grazing and disruption to the soil profile from hard hooves or burrowing. Excessive grazing may reduce the viability of a plant community or a species, particularly if that species is favoured by the animal as food, and effectively prevents re-colonisation of that species through changes to the soil profile.

4.9 Rehabilitation

Successful rehabilitation is essential to ensure the return of a self-sustaining vegetation community that is able to support native flora and flora species of conservation significance and resembles as far as practicable the vegetation communities that were removed at the commencement of mining.

Reconstruction of exactly the same vegetation communities is not possible as the landforms created by mining are fundamentally different in their shape and structure to those removed. However, with careful planning and implementation, key characteristics can be restored, allowing native vegetation to grow on the created landforms.

5 MANAGEMENT

5.1 Environmental Objectives

The objectives of this Flora and Vegetation EMP are to:

- Minimise the potential impacts to flora and vegetation, particularly those listed as significance (local, state and/or national), during all phases of the project including mobilisation, construction, operation, iron product transportation, maintenance and closure; and
- Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels.

Objectives will be met by implementing the management actions listed in Table 5-1.

5.2 Performance Indicators

The following key performance indicators will be used to assess performance against the environmental objectives listed in Section 5.1:

- Detailed project design does not exceed approved disturbance footprints;
- All personnel (including contractors) are inducted in the importance of conserving and minimising impact on the native flora and can carry out the management actions listed in this EMP;
- Plant propagules from conservation significant flora species are collected by a licensed and trained seed collector and prepared for rehabilitation purposes;
- Vegetation clearance does not exceed the allocated footprint;
- Mortality rate of translocated species; and
- Vegetation health is not indirectly impacted from mining and transport operations.

5.3 Management Actions

Table 5-1 provides a full list of management actions for flora and vegetation. This table will be used in annual compliance auditing and reporting.

Table 5-1 lists both key and subsidiary management actions. Key Management Actions (KMAs) are those actions that have been identified for each of the main project activities in relation to the key environmental factors, specifically flora, fauna, water, dust, closure and rehabilitation. They provide an overarching management framework for subsidiary or lower order management actions that may be undertaken in relation to individual environmental factors. The effectiveness of KMAs in addressing impacts may be reported externally whereas the subsidiary or lower order actions will be reviewed internally.

5.4 Specific Management for High Impact Flora and Vegetation

The project will have a moderate-high direct impact to five flora species and one PEC. These species and the PEC require particular attention and management, to ensure they are not further adversely affected indirectly. This is outlined below:

5.4.1 *Acacia karinae* (Priority 1)

A key management focus for *Acacia karinae* is the protection of existing populations located on Karara Ridge and adjacent to the proposed pit. This can be achieved via the implementation of the following management actions described below and in Table 5-1:

- Detailed engineering design will ensure that all mine components, infrastructure and facilities are contained within the construction footprint approved by the Minister for the Environment (FV01);
- Vegetation clearance will be undertaken progressively and in accordance with the Ground Disturbance Management Plan (FV11);
- Ground disturbance to be authorised through a procedure and permitting process prior to ground disturbance activities commencing (FV12);
- Boundary of approved clearing to be clearly marked on plans and on the ground (FV13); and
- The area of disturbance of all flora species of conservation significance will be recorded (FV16).

Like most Acacias the key reproductive mechanism for *Acacia karinae* is likely to be via seed germination. Successful rehabilitation of this species will depend on collection of seeds prior to ground disturbance and propagation of this species in a nursery. Topsoil will also be tracked and utilised for rehabilitation to utilise seed contained in topsoil. These requirements can be achieved via implementation of the following management actions:

- Vegetation clearance will be undertaken progressively (FV11);
- Plant propagules will be collected from conservation significant flora species by a licenced and trained seed collector in preparation for rehabilitation (FV15); and
- Topsoil to be reused immediately where practicable or otherwise, stockpiled and protected for use in rehabilitation (FV17).

KML will consider planting *Acacia karinae* seeds or seedlings that are excess to rehabilitation requirements in undisturbed areas of suitable habitat to ensure the genetic diversity of the species and its current regional distribution is maintained. Specific instructions for harvesting, and propagating seeds of *Acacia karinae* will be developed within the first few years of operation and adapted throughout the mine life to incorporate the results of rehabilitation trials.

5.4.2 *Lepidosperma* sp. Blue Hills (Priority 1)

A key management focus for this species must be on protecting remaining populations, particularly remaining populations on Karara and Blue Hills Ridge and adjacent to the proposed pit. This can be achieved via the implementation of management actions described in Section 5.4.1 and in Table 5-1 (FV11, FV12, FV13 and FV16).

As it is a sedge, the key reproductive mechanism for *Lepidosperma* sp. Blue Hills is via off-shoots from the parent plant. Successful rehabilitation of this species will depend on collection of whole plants (including root stock) from areas to be disturbed and translocated directly to undisturbed areas of suitable habitat or areas available for rehabilitation. This requirement can be achieved via implementation of the following management actions:

- Vegetation clearance will be undertaken progressively (FV11); and
- Plant propagules will be collected from conservation significant flora species by a licences and trained seed collector in preparation for rehabilitation (FV15).

Direct translocation of plants to areas of suitable habitat and propagation and growth of this species in a nursery will ensure that the genetic diversity of the species and its current regional distribution is maintained. In addition, specific instructions for harvesting, transplanting and growing this species will be developed prior to ground disturbance occurring.

Strategies for successful rehabilitation of this species (for instance, preferential planting on southeast facing slopes, staggered planting so that there are other established plants to help protect the species and undertaking genetic pool research to maintain genetic diversity of the species) will be developed within the first few years of operation and adapted throughout the mine life to incorporate the results of rehabilitation trials.

5.4.3 *Millotia dimorpha* (Priority 1)

A key management focus for *Millotia dimorpha* must be on protecting remaining populations; particularly the existing population located approximately 1.5 km south-west of the Accommodation Village. This can be achieved by the implementation of management actions FV01, FV11, FV12, FV13 and FV16 (described in Section 5.4.1).

As it is an annual species, the key reproductive mechanism for *Millotia dimorpha* is via seed germination. Successful rehabilitation of this species will depend on collection of seeds from this species and direct return, or short-term (less than 18 months) stockpiling of topsoil that is likely to contain seeds from *Millotia dimorpha*. These two requirements can be achieved via implementation of management actions described in Section 5.4.1 and Table 5-1 (FV11, FV15 and FV17).

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KML will consider planting *Millotia dimorpha* seed that is excess to rehabilitation requirements in undisturbed areas of suitable habitat to ensure the genetic diversity of the species and its current regional distribution is maintained. In addition, the Vegetation Clearance and Topsoil Management Plan include specific requirements for topsoil that is likely to contain seed of *Millotia dimorpha*.

5.4.4 Acacia woodmaniorum (DRF)

A key management focus for *Acacia woodmaniorum* must be on protecting those populations outside the disturbance area and translocating those populations which fall within the disturbance area.

A sub-population (sub-population 2l) of *Acacia woodmaniorum* occurs within the Terapod mining area and a population on the Mungada Ridge (population 2a), located 650m south, south-east of the Terapod mining area.

Protection of these populations can be achieved by the implementation of management actions FV01 - FV17, FV19 - FV26, FV28 – FV34, FV38, FV39 and FV41 (described in Section 5.4.1), in particular the following actions:

- Detailed engineering design will ensure that all mine components, infrastructure and facilities are contained within the construction footprint approved by the Minister for the Environment (FV01);
- Vegetation clearance will be undertaken progressively and in accordance with the Ground Disturbance Management Plan (FV11);
- Ground disturbance to be authorised through a procedure and permitting process prior to ground disturbance activities commencing (FV12);
- Boundary of approved clearing to be clearly marked on plans and on the ground (FV13);
- Plant propagules will be collected from conservation significant flora species by a licenced and trained seed collector in preparation for rehabilitation (FV15);
- The area of disturbance of all flora species of conservation significance will be recorded (FV16); and
- Topsoil to be reused immediately where practicable or otherwise, stockpiled and protected for use in rehabilitation (FV17).

As many individual plants as practicable from sub-population 2l will be removed carefully and directly translocated to a suitable rehabilitation location (FV15). The details from the translocation works will be recorded on a Flora Translocation Form and the final location signposted to restrict access (FV30). Vegetation health and photo monitoring will occur for the translocated individuals (FV39).

As the key reproductive mechanism for *Acacia woodmaniorum* is via seed germination, successful rehabilitation of sub-population 2l is dependent on the suitable management of topsoil resources from this area. Topsoil from within sub-population 2l will be managed in a manner which protects the viability of the *Acacia woodmaniorum* seed bank within. This will include direct return (FV17), short-term stockpiling, stripping in a manner which minimises

topsoil loss, separate stockpiling, stockpile signposting and recording of stockpile details on the soil resource register.

5.4.5 *Stylidium scintillans* (DRF)

A key management focus for *Stylidium Sp.* Yalgoo must be on protecting those populations outside the disturbance area and translocating those populations which fall within the disturbance area.

Over 415 individual *Stylidium scintillans* plants from the Terapod (Site ID – Terapod) population occur within the south-east corner of the Terapod mining proposal area. Over 1780 individual *Stylidium scintillans* plants from the same population occur 30m outside the eastern boundary of the Terapod mining area.

The population within the Terapod mining area will be protected by the implementation of management actions FV02, FV03, FV07 - FV09, FV11, FV12, FV14 - FV17, FV19 – FV23, FV26, FV28 – FV31, FV33, FV34, FV38, FV39 and FV41 (described in Section 5.4.1).

As many as practicable individual plants (415+ individuals) from within the Terapod mining area will be removed carefully and directly translocated to a suitable rehabilitation location (FV15). The details from the translocation works will be recorded on a Flora Translocation Form and the final location signposted to restrict access (FV30). Vegetation health and photo monitoring will occur for the translocated individuals (FV39).

As the key reproductive mechanism for *Stylidium scintillans* is via seed germination, successful rehabilitation of the population within the Terapod mine area will include the suitable management of topsoil from this population area. Topsoil from this area will be managed in a manner which protects the viability of the *Stylidium scintillans* seed bank within. This will include direct return (FV17), short-term stockpiling, stripping in a manner which minimises topsoil loss, separate stockpiling, stockpile signposting and recording of stockpile details on the soil resource register.

The population outside the Terapod mining area will be protected by the implementation of management actions FV01 – FV15, FV19 – FV23, FV26, FV28 – FV31, FV33, FV34, FV39, and FV41 (described in Section 5.4.1).

The protection of the population outside the Terapod mining area will be achieved specifically through the following actions:

- Access to the population will be restricted through signage and awareness (FV11 – FV13, FV26, FV30);
- Depositional dust monitoring from within the population (FV23);
- Vegetation health monitoring of the population (FV39); and
- Onsite weed management provisions (FV08).

5.4.6 Priority Ecological Community

The PEC will require particular management to ensure that it is not directly and indirectly impacted by the development and operation of the mine. Weeds, fire, feral animals, dust, overspray from dust suppression water, and ground disturbance have been identified as potential key issues to the PEC.

To prevent accidental clearing of the PEC, ground disturbance must be authorised through a procedure and permitting process prior to ground disturbance activities commencing (FV12). The boundary of approved clearing will be clearly marked on plans and on the ground (FV13).

Weeds will be managed and monitored through a weed management plan and weed hygiene procedure (FV19 and FV20).

Dust will be controlled and monitored in accordance with a dust management plan and monitoring procedure (FV21 and FV23). Dust deposition gauges will be located within and near the PEC to monitor for dust deposition on vegetation.

Where water is used for dust suppression, training and systems will be implemented to ensure that the extent will only be as necessary and will prevent excess overspray in the surrounding environment (FV24, FV 25 and FV 38).

Feral animals will be controlled through the implementation of the feral animal management plan (FV33).

Fire prevention measures will be developed and incorporated in a fire management plan (FV41).

Monitoring of flora and vegetation health in the PEC will be a key aspect of the ongoing management of the PEC. This is further discussed in Section 6 below.

5.4.7 Gilgai Formation

Specialist soil and groundwater assessments have determined that the formation does not meet the requirements of a Gilgai, therefore vegetation health monitoring within this area is not considered necessary.

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Table 5-1 Key Management Actions

Project Activity	Management Action	Responsibility	Timing	Evidence/KPI
Detailed engineering design.	Detailed engineering design will ensure that all mine components, infrastructure and facilities are contained within the disturbance footprint approved by the Minister for the Environment.	KML Environmental Superintendent	Pre-construction	Detailed design show all project components within the approved disturbance footprint.
	Environmental constraints and approved disturbance areas communicated to design team.	KML Environmental Superintendent	During detailed design	Final design has a total footprint less than or equal to 3,028 ha
	Design reviews to be conducted with the aim of minimising impacts to vegetation and flora of conservation significance.	KML Environmental Superintendent	Prior to sign off on detailed design	Documented results of design review.
	Detailed designs will include management strategies for surface water drainage to prevent disruption to surface water flow. For example, environmental culverts will be installed along the rail embankment to maintain existing surface water conditions.	Construction Manager / Mine Manager	During detailed design	Final design includes effective surface water management strategies
Procurement of goods and services	KML will ensure that all contracts for goods and/or services include appropriate clauses to ensure accountability by the contractor for environmental management.	Mine Manager	Pre-mobilisation	Contract records
	Provisions addressing the minimisation of land disturbance will be included in contracts with all earthmoving and land clearing contractors.	Mine Manager	Prior to engaging contractors	Provisions in signed contracts.
Mobilisation of personnel and equipment and transport of supplies	KML employees and contractors will have undergone awareness training that includes: <ul style="list-style-type: none"> • An induction prior to commencement of work on the project; • Awareness training sessions on environmental risks and management; and • Ground disturbance procedures and permit requirements. 	Mine Manager	Construction, Operations and Closure	Induction records.
	All vehicles, equipment and machinery to arrive on site clean from soil and vegetation.	Mine manager	Prior to commissioning equipment	Hygiene certificates and/or inspection logbook
	Prior to construction and throughout the life of the project, a fire prevention and control strategy will have been developed and implemented.	Mine Manager	Pre-construction	Fire prevention and control strategy.

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Project Activity	Management Action	Responsibility	Timing	Evidence/KPI
	Watering of roads for dust suppression purposes will occur as required. Sufficient water will be made available to meet dust suppression requirements.	Mine Manager	Construction and Operations	Results of dust monitoring.
Ground Disturbance	Vegetation clearance will be undertaken progressively, limited to the approved clearance footprint, restricted to the minimum area needed at the time to facilitate ongoing production and is in accordance with the Ground Disturbance Management Plan.	Mine Manager	Construction	Vegetation and soils clearance management plan Clearing kept within identified footprint
	Ground disturbance to be authorised through the GD permitting process prior to ground disturbing activities commencing. This protocol will include supervision of initial clearing pass along the interface between clearing and protected areas, progressive extension of clearing from the initial clearing line and stockpiling of topsoil and cleared vegetation within designated areas.	Mine Manager	Construction and Operations	Permits approved for all instances of ground disturbance.
	Boundary of approved clearing to be clearly marked on plans and on the ground.	Mine Manager	Prior to ground disturbance activities.	No clearing beyond approved areas. Total area cleared, including maps, provided an AER.
	Construction and operations planning meetings will include ground disturbance and rehabilitation as an agenda item. Areas to be cleared are to be identified and any conditions including clearing limits, rehabilitation and exclusion and avoidance areas to be communicated to relevant personnel. Meetings to include environmental representation.	Mine Manager	Construction and Operations	Meeting agendas and minutes
	Plant propagules will be collected from conservation significant flora species by a licensed and trained seed collector in preparation for rehabilitation. Seed and other propagules will be collected and managed in accordance with site procedures.	Mine Manager	Construction and Operations	Seed 'bank'.
	The area of disturbance of all flora species of conservation significance will be recorded.	Mine Manager	Construction and Operations	Area of disturbance reported annually in AER.
	Topsoil to be reused immediately where practicable or otherwise, stockpiled and protected for use in rehabilitation.	Mine Manager	Construction and Operations	Records of topsoil use and stockpiling to be kept on site.

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Project Activity	Management Action	Responsibility	Timing	Evidence/KPI
	Vegetation cleared along the Access Road to be stockpiled to one side of the road and allowed to decompose and provide ground habitat and a source of seed for revegetation.	Karara Mine Management Team	Construction	Post construction inspection of Access road to confirm rm.
	Where water is used for dust suppression, implement training and systems to ensure that the extent will only be necessary and will prevent excess overspray into the surrounding environment. The quality and application of dust suppression water will be in accordance with the following: <ul style="list-style-type: none"> • Water less than 15,000 TDS shall be used to suppress dust; and • Trickle bars or similar shall be used to apply water. 	Mine and Infrastructure Managers	Construction	No overspray of dust suppressant water.
	A conservation significant flora and significant vegetation monitoring program will be undertaken.	KML Environmental Superintendent	Construction	Vegetation Health Monitoring
Operation of mine infrastructure, equipment and machinery	Weeds will be managed and controlled in accordance with the Weed and Plant Pathogen Management Plan, including provisions for preventing new weed species from entering KML sites and preventing the spread of weeds that are currently present.	Karara Mine Management Team	Construction, Operations and Closure	Periodic internal audit of weed and plant pathogen management plan actions.
	Regular weed inspections will be conducted to ensure that there is no increase in the density and distribution of known weed species and that new weed species are not introduced. Identified populations of declared weeds to be controlled through manual weed spraying, in accordance with site weed management procedures.	KML Environmental Superintendent	Operations	Results of survey reported annually in AER.
	Control of dust emissions for all project components will be undertaken in accordance with the Dust EMP.	Karara Mine Management Team	Construction and Operations	Periodic internal audit of Dust EMP actions
	Vehicle speeds and movements are managed through a Traffic Management Plan, which takes into account the needs of flora and dust management. Traffic speeds will be signposted and adhered to on site. Traffic entering the site will be directed through security control at the main gate. Traffic will be restricted to designated roads. Off road driving will be prohibited on site.	Mine Manager	Construction and Operations	Traffic Management Plan Signage Induction Records

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Project Activity	Management Action	Responsibility	Timing	Evidence/KPI
	Where water is used for dust suppression, the extent of application will only be as necessary and mechanisms will be put in place to prevent excess overspray into surrounding vegetation. Haul roads to be constructed to ensure that any run off is contained in drainage sumps and prevented from entering the environment. Pipelines containing saline water to be bunded to prevent spills entering the environment. All turkey's nests and ponds containing saline water to be lined and monitored for seepage.	Mine Manager	Construction and Operations	No evidence of salt damage to plants caused by dust suppression activities greater than 5 m from where dust suppression has been undertaken.
	Movement of personnel beyond the disturbance footprint will be restricted.	Mine Manager	Construction, Operations and Closure	No reported incidents of unauthorised off-road driving.
	A conservation of significant flora species identification guide will be made available to personnel and will be available prior to construction.	KML Environmental Superintendent	Prior to construction	Significant flora species ID guide distributed prior to commencement of construction.
	Any occurrence of rare or priority flora or conservation significant vegetation is to be mapped and spatial data locations and occurrences maintained in KML's internal GIS system. This data base is to be checked prior to on-site clearing to ensure these species can be avoided where practicable.	Mine Manager	Construction, Operations and Closure	Information available on GIS database.
	Signage will be used to identify sensitive environmental areas as "no go" areas. These may include areas of high-risk populations of significant flora that occur in close proximity to operations. These areas will be monitored regularly to determine if they are adversely affected by potential indirect impacts.	Mine Manager	Construction and Operations.	Signs in place. Results of monitoring to be reported annually in AER.
	Any unauthorised clearing (including accidental clearing) will be recorded and reported annually.	Mine Manager	Construction and Operations	Reported annually in AER.
	All use, disposal and storage of hydrocarbons and other chemicals will be carried out according to a hydrocarbon and hazardous chemicals management plan.	Mine Manager	Construction and Operations	No incidents of hydrocarbon or chemical spill.
	Feral animals, specifically herbivores, are controlled in accordance of the Feral Animal Management Plan.	Mine Manager	Operations and Rehabilitation	There is no increase in the population of feral herbivores in the area.

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Project Activity	Management Action	Responsibility	Timing	Evidence/KPI
	Monitoring programs will be undertaken to ensure that all project activities are in accordance with their relevant EMPs, Acts and legislation (see Section 6 for flora monitoring requirements).	Mine Manager	Operations	Results of surveys and audits to be reported annually in AER.
	Fire will be managed in accordance with a fire management plan.	Mine Manager	Construction and Operations	No unauthorized outbreaks of fire.
Rehabilitation	Rehabilitation practices and monitoring will be developed in accordance with the Rehabilitation and Closure Plan, including: <ul style="list-style-type: none"> • Land-system specific; • Progressive rehabilitation; • Landform stability; • Landform visual amenity; • Establishment and maintenance of appropriate vegetation cover; and • Adequate financial provision for closure 	Mine Manager	Operations	Rehabilitation records
	Develop and adaptively implement (including ongoing monitoring, review of rehabilitation and adaptation of rehabilitation procedures) Land System specific rehabilitation to recreate pre-disturbance physical and biological characteristics (i.e., re-establishment of appropriate flora assemblages and composition on appropriate substrate).	Mine Manager	Operations	Results of rehabilitation trials etc to be reported annually in the AER
	Develop a rehabilitation strategy for significant flora species, including procedures for collection of propagules, preparation of seedlings, planting, watering etc.	Environmental Superintendent	Construction, Operations and Closure	Rehabilitation strategy for significant flora species addressed in closure plans.

6 MONITORING

6.1 Monitoring Programs

In order to ensure progress towards the achievement of the objectives of this EMP, ongoing flora and vegetation monitoring will be undertaken. Monitoring methods will include, as appropriate, visual observation and photographic inspections of vegetation, quantitative quadrat or transect based surveys and measures of plant health. These monitoring measures will be implemented to allow assessment of:

- Changes in the abundance, composition or condition of flora and vegetation species, particularly threatened species;
- On-going impacts to flora and vegetation species as a result of project-related activities; and
- The extent of vegetation and habitat clearing.

Vegetation monitoring will be designed to target the presence or absence of species of conservation significance and to ensure that the impact assessment conducted prior to construction accurately assessed the risk of potential indirect impacts to flora and vegetation. Monitoring programs will be established for:

- Populations of conservation significant flora species and the PEC, where it is determined that the project could significantly impact those populations or communities. This includes populations that have been translocated;
- Vegetation where dust deposition may have a significant impact;
- Vegetation where altered hydrology may have a significant impact; and
- Vegetation where groundwater drawdown may have a significant impact.

These monitoring programs detail survey method, survey timing, site selection, reporting and trigger criteria for further action should a significant impact be detected, and will be developed prior to the commencement of construction.

Specific monitoring programs will include, but are not limited to:

- Intensive monitoring of potential indirect impacts from dust deposition, weeds, dust suppression water, and feral animals within the PEC;
- Monitoring of potential indirect impacts, including dust deposition and altered hydrology, within on-site and translocated populations of *Acacia karinae*, *Lepidosperma* sp. Blue Hills, *Acacia woodmanorium*, *Stylium scintillans*, *Tecticornia bulbosa* and *Millotia dimorpha*;
- Monitoring of dust impacts along high-traffic roads;
- Monitoring of potential water overspray impacts to vegetation adjacent to construction and operational footprints; and

- Monitoring of potential surface water drainage shadows downstream of significant infrastructure.

6.2 Additional Surveys and Studies

In addition to onsite monitoring, mapping of FCTs on adjacent BIF ridges will be undertaken to increase the understanding of the conservation status of FCTs in the project area.

KML are also currently conducting research and development projects as follows:

- Determination of the taxonomy of *Lepidosperma* sp. Blue Hills;
- Assessment of the genetic variation in populations of *Lepidosperma* sp. Blue Hills, *Acacia woodmaniorum* and *Acacia karinae*; and
- Determination of propagation strategies for *Lepidosperma* sp. Blue Hills, *Acacia woodmaniorum* and *Acacia karinae*.

6.3 Opportunistic Recordings

Opportunistic recordings of conservation significant flora species will be recorded by KML personnel and verified by a qualified botanist and records included in the site flora database.

7 CONTINGENCIES

7.1 Dust

7.1.1 Trigger

Vegetation health will be monitored to identify any impacts on vegetation from fugitive dust. The trigger level will be set at a quantity of dust deposition below the level at which plant stress may occur. This level has been set at 10g/m²/month as an internal KML parameter, set out in the KIOF Public Environmental Review (2008).

7.1.2 Possible Contingencies

Reduce dust levels through prevention and management measures, e.g. dust suppression with water, limiting clearing and high dust creating activities to days with low or no wind, etc.

7.2 Altered Surface Hydrology

7.2.1 Trigger

Vegetation health will be monitored in locations where drainage shadow or inundation/rising groundwater present a risk. A trigger level may be developed for soil moisture content level, below which plant stress may occur. A trigger level should be set to determine the maximum level of groundwater rise. These levels will be determined through the monitoring programs.

7.2.2 Possible Contingencies

- Develop an engineering solution to remove the drainage shadow.
- Develop an engineering solution to increase the water reclamation and reduce inundation/groundwater effects.

7.3 Salinity

7.3.1 Trigger

A monitoring program will be implemented to determine the impact of salt water used for dust suppression on verge vegetation adjacent to construction and operational footprints.

Should an environmental incident involving a significant discharge of saline water into the environment occur, these sites will be monitored to determine vegetation loss and recovery.

7.3.2 Possible Contingencies

- Reduce salinity levels for water dust suppression.
- Use only water with a salinity of less than 15,000 mg/L TDS for dust suppression near topsoil stockpiles or native vegetation.

7.4 Groundwater Mounding

7.4.1 Trigger

An adaptive management plan will be implemented to manage potential impacts on vegetation due to groundwater mounding in the vicinity of the wet TSF. A current vegetation health monitoring program is being implemented to identify impacts on the vegetation surrounding the wet TSF. The trigger for implementing contingency actions will be determined through the monitoring program and impacts identified.

7.4.2 Possible Contingencies

Implement abstraction practices to reduce groundwater mounding of affected areas. This may require review of hydrogeological modelling for the site and additional hydrogeology study to determine the most effective way to minimise groundwater mounding in the area.

8 AUDITING AND REPORTING

This EMP and its outcomes and commitments will be audited annually as per the Audit Schedule. The key management actions identified in Table 5-1 will form the basis for this audit. The outcomes of this audit will be reported annually and will be made available to the DWER and DMIRS.

The results of further flora surveys, recovery projects, academic studies, incident reports relating to flora and the details of any other significant flora-related issues will be included in annual reporting of environmental management/monitoring results to the statutory authorities. This will be additional to any event-based reporting e.g. unapproved mortalities of conservation significant flora.

9 REVIEW AND REVISION

This plan is intended to be adaptive and is subject to change depending on emerging issues and as new information becomes available. This plan will be reviewed every two years by the KML Environment department.

10 REFERENCES

KML (2008) *Karara Iron Ore Project: Public Environmental Review*. Karara Mining Limited.

Markey, A. S. & Dillon, S. J. (2008) *Flora and Vegetation of the Banded Ironstone Formations of the Yilgarn Craton: The Central Talling Land System*.

Woodman Environmental Consulting (2007) *Haulage Route, Tilley Siding and Associated Borrow Pits of the Proposed Mungada Ridge Hematite Project*.

Woodman Environmental Consulting (2008) *Flora and Vegetation Assessment of the proposed Linear Infrastructure Corridor – Proposed Karara Iron ore Project*.