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Draft EIS - Appendix F Weed and Pest Management Plan

Western Desert Resources Limited
Roper Bar Iron Ore Project



2012



DRAFT

**Weed and Pest
Management Plan
Roper Bar Iron Ore Project
EIS Appendix F**

Western Desert Resources Ltd

DW120004

Roper Bar Iron Ore Project

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Executive Summary

Western Desert Resources Limited (WDRL) is proposing to develop an iron ore mine in the Gulf region of the Northern Territory. The project is titled the Roper Bar Iron Ore Project (RBIO, the Project). As part of the approvals process WDRL submitted a Notice of Intent in 2011 which was referred to the Northern Territory Department of Natural Resources, Environment the Arts and Sport (NRETAS) for environmental assessment. The NT Minister for Natural Resources, Environment and Heritage determined that the Project required formal assessment under the NT Environmental Assessment Act at the level of an Environmental Impact Statement (EIS).

One of the risks from the project to the region's biodiversity is the potential for weed and pest introduction and spread. Consequently, this Weed and Pest Management Plan (WPMP) has been developed.

A search of existing biodiversity databases and recent data from ecological survey lists 75 species of weed and six species of pest from within and nearby to the mine site and associated infrastructure. Some of these are considered Class A weeds under the NT *Weeds Management Act 2001* which give an obligation on landholders to eradicate. Due to the comparative lack of ecological survey in the area it is acknowledged that these data are far from comprehensive. WDRL has committed to a pre-construction weed survey to improve knowledge of the regional weed assemblage but also to identify specific locations of weed infestations to aid in weed management planning and management.

This WPMP establishes the objectives, management requirements and management actions to mitigate and manage the potential impacts that could arise from the introduction and increase in abundance of weed and pest species within the project area.

This plan has been prepared with the view to achieve the following specific long-term objectives:

- Ensure no new weed or pest species are introduced;
- Ensure the abundance and extent of existing weed species are reduced; and
- Maintain and enhance the biodiversity values of the site

To achieve these objectives this WPMP identifies control options, procedures, responsibilities and reporting frameworks.

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Acronyms

DSEWPC – Department of Sustainability, Environment, Water, Populations and Communities

EIS – Environmental Impact Statement

EL – Exploration Lease

MLA – Mineral Lease Application

NRETAS – Department of Natural Resources the Arts and Sport

OGV – Ocean Going Vessel

RBIO – Roper Bar Iron Ore

STP - Sewage Treatment Plant

WDRL – Western Desert Resources Limited

WoNS – Weeds of National Significance

WPMP – Weed and Pest Management Plan

1 Introduction

Western Desert Resources Limited (WDRL) is seeking approval to mine iron ore reserves within existing mining leases under application (MLA 28264 and 28963) in the Roper Bar Region of the Northern Territory. It is proposed that the mined product will be transported to the existing port facility at Bing Bong via a 165km long haul road to enable the transshipment of product to markets in China. This proposal is collectively named the Roper Bar Iron Ore (RBIO) Project. The project involves the clearing of a large area to facilitate the establishment of ancillary infrastructure and tracks, and will involve ongoing environmental disturbance during the proposed active mining phase. This activity has been identified as introducing a considerable risk to the existing natural values in surrounding areas from the invasion and spread of weed and pest species.

This Weed and Pest Management Plan (WPMP) has been prepared as part of the Environmental Impact Statement (EIS) at the request of the Northern Territory Minister for Natural Resources, Environment and Heritage (the Minister) and addresses all key requirements (linked to weed and pest management planning) recognised in the NRETAS *Draft Guidelines for the preparation of an Environmental Impact Statement, Roper Bar Iron Ore Project, Western Desert Resources, March 2012*. This plan provides the framework to ensure controls to manage potential weed and pest disturbance within and directly adjacent to the proposed Roper Bar Iron Ore (RBIO) project facility in the Roper Region.

1.1 Project Description

WDRL hold a number of Exploration Leases (ELs) and currently has five Mineral Lease Applications (MLAs) lodged with the Northern Territory Government. WDRL's proposed Roper Bar Iron Ore (RBIO) Project includes key development of three areas:

- **Mine Area:** This area includes the entire mining areas (MLA 28264 and MLA 28963) and associated infrastructure leases (MLA 28266 – Airstrip, MLA 28267 – Infrastructure, MLA 28962 –Camp) as shown in Figure 1. Initial mining is proposed at MLA 28264 which contains a number of high grade ore bodies including areas F and E East, which will underpin production for approximately 8 years. A series of open pits varying in depths between 20 and 100 plus vertical metres will be developed. Progressive rehabilitation of these pits will be undertaken with the backfilling of excavated wastes and scraped topsoil once mining operations have ceased.
- **Haul Road:** This area includes a 165km long x up to 50m wide corridor with a 10m wide sealed road from the MLA to the stockyard at Bing Bong Port. Excavated product will be transported to the existing Bing Bong facility via the proposed Haul Road in covered road trains.
- **Bing Bong Port & Stockyard:** This area includes a development of a 50ha stockyard facility, conveyor route (with maintenance track), and barge loading facility as part of the proposed coastal development. Product will be deposited and stockpiled inland at a stock yard facility 1.8 km from the coast. The ore will then be transported to a barge loading facility at the Bing Bong port facility via a covered conveyor where it will be loaded onto a barge to be conveyed to Ocean Going Vessels (OGV) moored approximately 20-30 km off shore in accordance with existing operations at Bing Bong.

These three areas are depicted in Figure 2, with a detailed map for the Bing Bong Port and Stockyard shown in Figure 3..

The total area of prospective ground disturbance for the entire project is approximately 1350ha. The project will involve a greater proportion of land clearing within the Mine area (450 ha) and Haul Road corridor (approximately 850 ha) with a minor amount of clearing proposed for the Coastal Port area (50 ha).

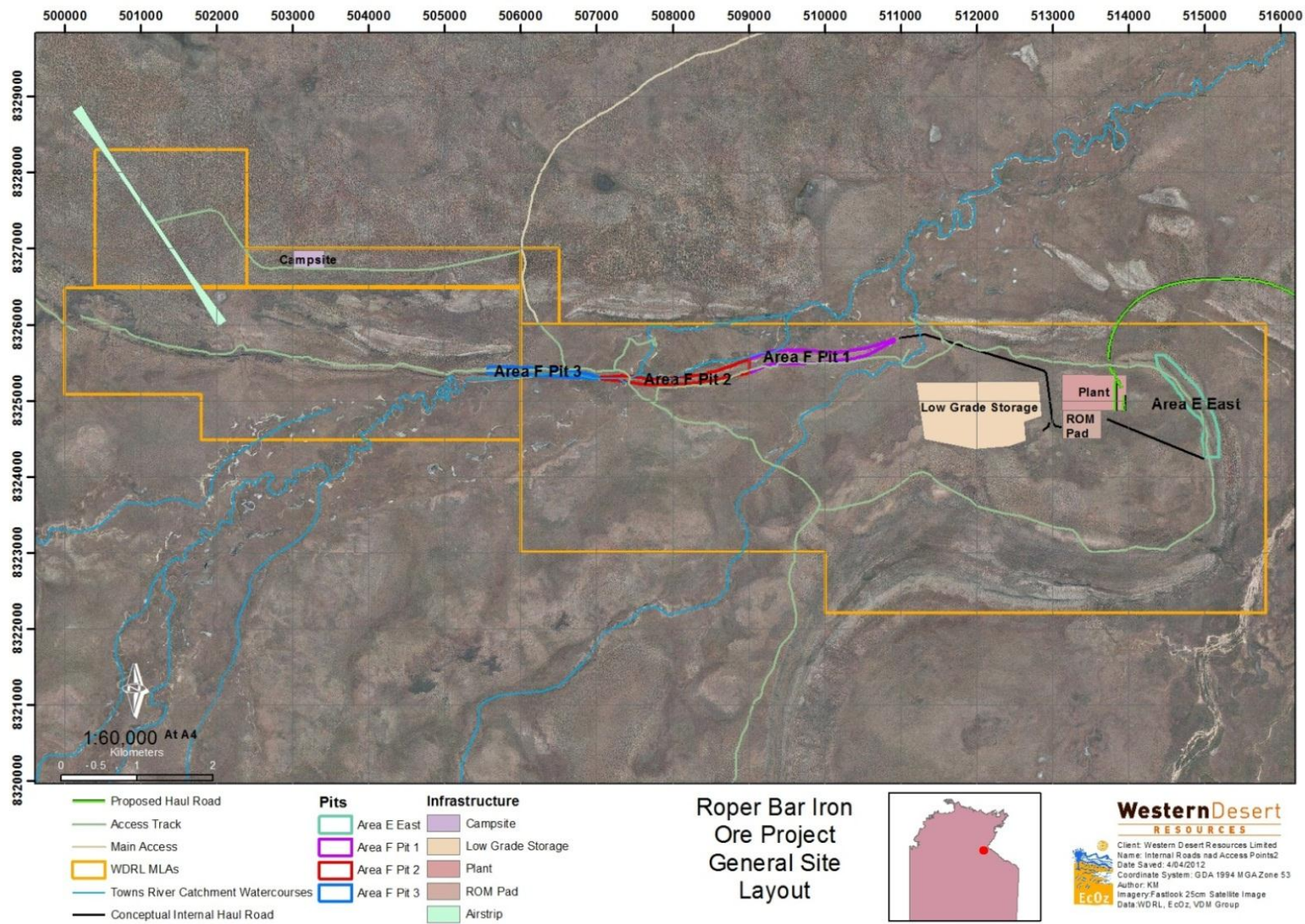


Figure 1: Roper Bar Iron Ore Project General Site Layout

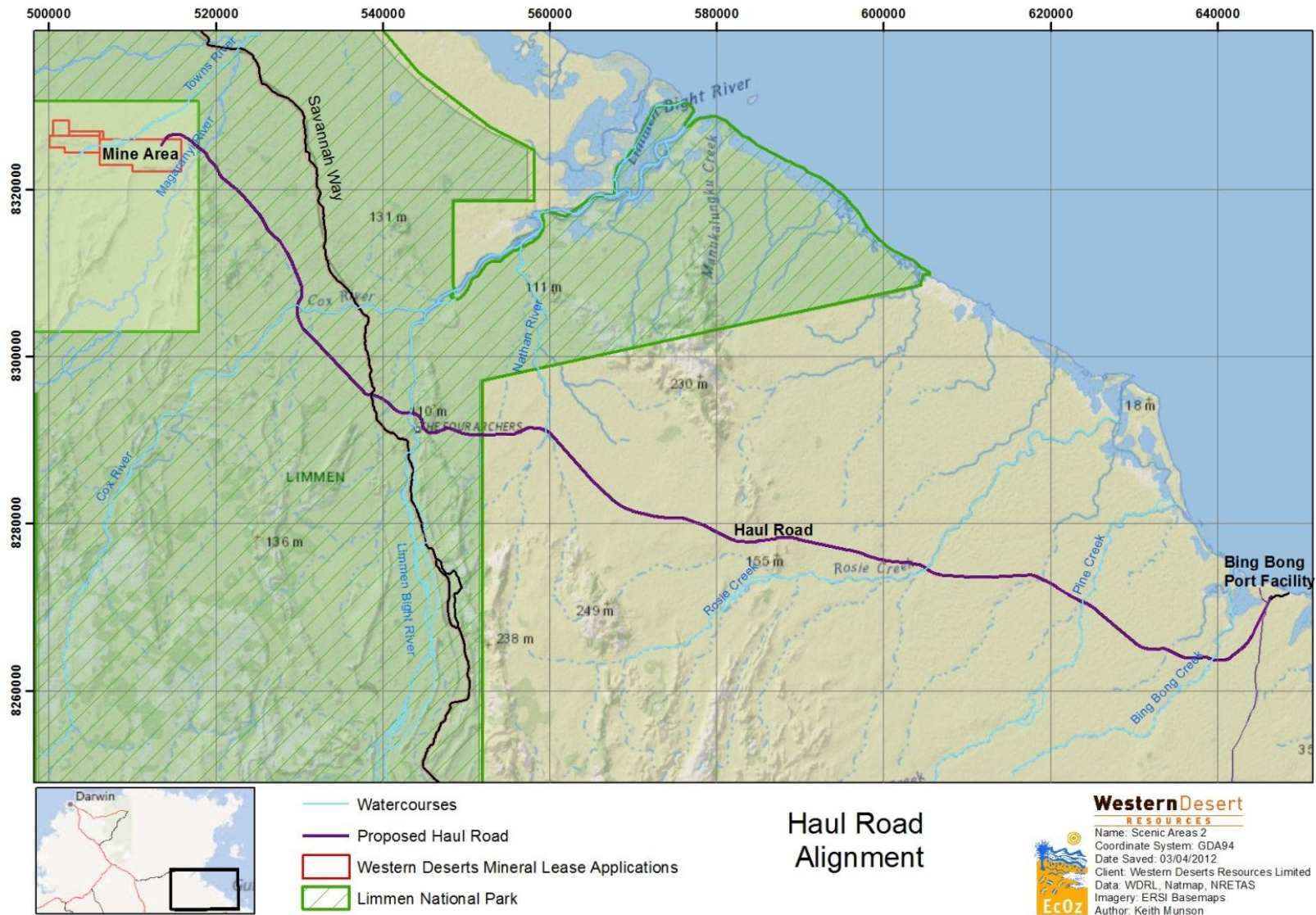


Figure 2 Roper Bar Mine Area, Haul Road and Bing Bong Port and Stockyard



Figure 3 The Bing Bong Port and Stockyard site layout

1.1.1 Project Location, Land Use and Tenure

The RBIO Project area falls within two bioregions, Gulf Fall and Upland; and Gulf Coastal bioregion. These regions support extensive areas of intact (uncleared) and relatively common land types interspersed with a number of major river systems and low rocky hills. All rivers and creeks within this system flow towards the Gulf of Carpentaria. The riparian zones, wetlands and rocky outcrops provide localised hotspots for the regional biodiversity. A number of notable plant and animal species are found within the Gulf region, including those which are rare, threatened or occur only within a restricted range.

The MLA does not occur within a site of conservation significance. The proposed haul road and coastal port facility fall within the northern tip of the McArthur River Coastal Floodplain Site of Conservation Significance. The McArthur River Coastal Floodplain is recognised as having outstanding conservation values which attract very large aggregations of migratory shorebirds. Waterbirds breed in the mangroves at the site, and seabirds use coastal sand spits for nesting. Figure 4 shows the location of the project in relation to local bioregions and sites of conservation significance.

The predominant land uses in the region are the existing McArthur River Mine and ancillary infrastructure, pastoral leases, Aboriginal lands and outstations and large areas of undeveloped lands and coastline. There are no significant coastal townships, with the town of Borroloola located approximately 40 km inland from the Port of Bing Bong, and the Bing Bong Station homestead is located approximately 5 km to the west.

Current road access to the mine and ancillary infrastructure site is via the Roper Highway, which departs the Stuart Highway 10km South of Mataranka. This road is largely a single lane sealed road to Roper Bar. Approximately 5km west of the Roper Bar Store, the Nathan River Road heads south from the Roper Highway and ultimately intersects the Carpentaria Highway near Cape Crawford 340km away. This section of road is unsealed and is where the project area is located, approximately 140km from Roper Bar. The Roper Highway and the Nathan River road form part of the Savannah Way. The same access will be used throughout the life of project to access the mine and ancillary infrastructure when moving from Darwin or any other town.

A brief description on the location and land use within three key developments areas is outlined below (see also Figure 5):

- **Mine Area:** This area is located in the Roper Bar Region of the Northern Territory, southwest of the township of Ngukurr. The mineral leases fall within vacant crown land NT Portion 0819, former St. Vidgeon Pastoral Lease. This area has been excluded from the new proposed boundaries of Limmen National Park. This area is located within the middle reaches of the Towns River catchment. The main Towns River channel passes through the centre of the project area (including Area F deposit), while several small spring-fed creeks in eastern portion (Area E deposit) drains directly into the Magaranyi River.
- **Haul Road:** The haul road route crosses seven major water courses, and also crosses the Nathan River Road (Savannah Way Tourist Route). A section of the proposed haul road (approximately 50km) traversing through the St. Vidgeon and Nathan River Station is located within the new proposed Limmen National Park boundaries. The haul road crosses into the proposed park around 5 km from the start of the haul road and exits between the Limmen Bight River and Nathan River around the 54 km mark.
- **Bing-Bong Port:** Bing Bong Port is located on the Gulf coast within an area of coastal sand dunes, sand sheets, and chenier plains adjacent to tidal mud flats, tidal creeks, and mangroves. Currently, the Bing Bong Port Facility is a single user port facility owned and operated by Xstrata to service its McArthur River Mine (MRM) operation. This site does not intersect any natural drainage lines. The main drainage lines beyond the site are Mule Creek to the east and Bing Bong Creek to the north. The area is subject to storm surges associated with cyclones.

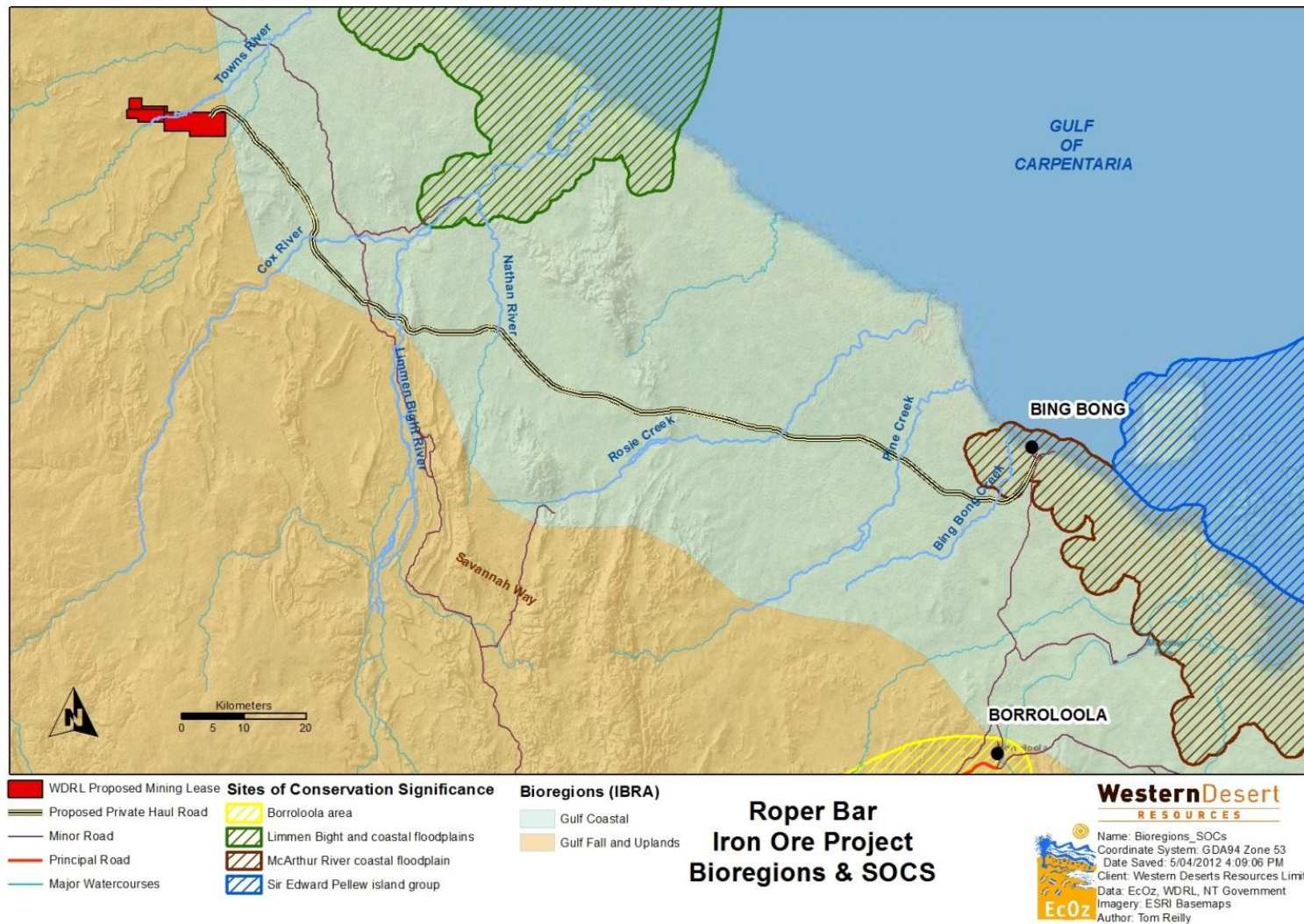


Figure 4 Roper Bar Iron Ore Project Bioregions and Sites of Conservation Significance

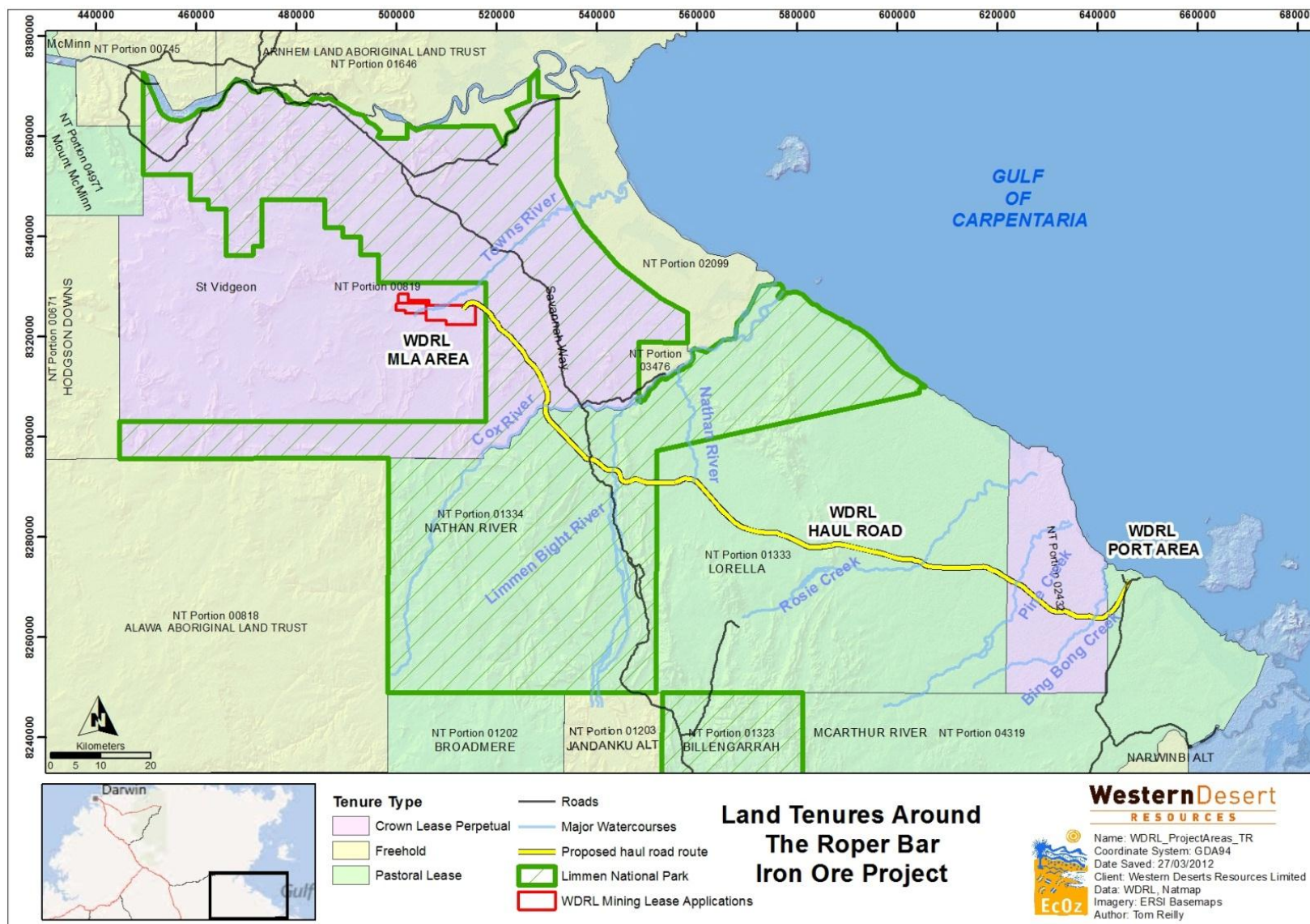


Figure 5 Land Tenures around the Roper Bar Iron Ore Project

1.1.2 Overview of Weed and Pest Issues

A weed can be defined as an exotic species (foreign/introduced species) or a native species that colonises and persists in an ecosystem in which it did not previously exist and is unwanted in that environment. Weeds are able to successfully establish and spread due to the absence of natural predators and diseases which gives them a competitive edge over native species thereby changing the natural diversity and balance of ecological communities. An induced disturbance to the natural environment (such as clearing) and movement of machinery, vehicles and equipment create ideal conditions for weed growth and contribute to weed spread.

A pest can be defined as any animal inhabiting an area where it is not wanted. These animals also compromise biodiversity through resource competition, predation, poisoning and introduction of disease and also causing land degradation by promoting soil erosion, stream turbidity and the spread of weeds.

Vegetation clearance and continued disturbance associated with the proposal are identified as having the potential to introduce weed and pest species and potentially lead to an increase in extent of weeds. Both, pests and weeds require appropriate management actions to reduce their impact on the economy, the environment, human health and amenity.

1.1.3 Report Scope

This report addresses all key weed and pest management planning requirements described in the EIS guidelines. Specifically, this report provides detail on -

- occurrence of weed species, including Weeds of National Significance, which occur on or near the Project area, or have potential to infest project sites;
- the incidence reporting of pest species on or near the project area;
- impacts associated with the invasive/exotic species introduction and increase in abundance;
- mitigation measures; and
- evaluation of management efficacy.

This study has been conducted for the entire project area inclusive of mine area, hauls road and Bing Bong port, and recommends the general mitigations measures to be used by WDRL throughout the life of project (establishment, operation and decommissioning phase).

2 Relevant Legislation, Policy and Strategy

The following legislation, policies and strategies are relevant to this work:

Commonwealth

- Environment Protection and Biodiversity Conservation Act 1999
- Revised National Weeds Strategy 1999
- Quarantine Act 1908
- Agricultural and Veterinary Chemicals Code Act 1994

Northern Territory Legislation and Strategy

- Weed Management Act 2001
- Territory Park and Wildlife Conservation Act 2006
- NT Fisheries Act

3 Existing and Potential Weeds and Pests

A targeted weed study has not yet been conducted within the project area. WDRL commits to perform a targeted weed survey within the areas proposed for development prior to construction activities. This pre-construction weed survey will target areas potentially supporting weed species of concern and record the overall abundance and diversity of weed species, and determine the associated impacts these species could have to the biodiversity values of the region. This information will be used in future to develop a targeted weed management plan to rectify disturbed and weed infested areas and prevent the establishment of new outbreaks.

The weed data used to inform this WPMP comes from a range of sources:

EcOz Flora and Fauna Assessments: Flora and Fauna assessments have been undertaken by EcOz Environmental Services (EcOz) in three key development areas (proposed mine area, haul road and coastal port facilities) to develop a knowledge of the biodiversity and an identification of areas or species which may be sensitive to the proposed disturbance. These surveys have primarily targeted on areas more likely to feature the greater range of species within the local area, and within the areas in which particular species or habitat may be sensitive to disturbance. A lesser emphasis was placed on sampling the more common or extensive habitats found throughout the project area. The data on weeds and feral animals' occurrence has been collected within all of the survey locations and their surrounds with other vital information on habitat characteristics, vegetation structure, abundance and diversity of flora and fauna populations.

EPBC Protected Matters Search tool: This search tool is maintained by the Department of Sustainability, Environment, Water, Populations, and Communities (DSEWPC) and holds mapped locations of World Heritage properties, Ramsar wetlands, threatened species, migratory species, marine species, threatened ecological communities, protected areas and threatening processes including weeds;

NT Weed Dataset: This dataset is maintained by the Weed Management Branch, Northern Territory and holds data for known weed infestation in the Northern Territory. ;

NT Atlas Flora and Fauna Dataset: This dataset is maintained by the Department of Natural Resources Environment and Arts and holds the records of flora and fauna sightings collected from a range of sources like literature searches, biological surveys conducted under a Wildlife Permit, NT Weeds Dataset, NT Holtz database (a dataset for the location and details for vouchered plant specimens only), Museum and Art Gallery of the NT database (a dataset for vouchered fauna only), Birds Australia (a database created through community input) etc;

Holtz Dataset: This dataset is maintained by the Northern Territory Herbarium and stores data on specimens vouchered within the herbarium.

3.1 Weeds

Desktop and recent field studies of the region were combined to develop an idea of the current and potential weed species (Table 1). A total of 75 weed species are known to exist or have the potential to invade into the environment of the project area. Of these eight are recognised as high priority weeds (declared Class A under *Weed Management Act 2001*) and 18 are recognised as being moderate priority weeds (declared Class B under *Weed Management Act 2001*).

Table 2 shows opportunistic weed sightings recorded during recent work within the development area. This table elaborates on location and extent of infestation; four declared weeds were found during this work. This list also includes one species, *Parkinsonia aculeata*, which is recognised as a threat at the national level (*Revised National Weed Strategy 1999*) and is included in the list of WoNS (Weed of National Significance). Localised patches of weed infestations were found in the vicinity of river crossings traversing the proposed haul road corridor and within the Bing Bong port area. Even after considerable formal flora survey and vegetation mapping the mine area has no known weeds. Riparian habitat assessment within the proposed

haul road corridor identified a total of four exotic plants (*Passiflora foetida*, *Hyptis suaveolens*, *Sida acuta*, *Jatropha gossypifolia*).

From existing data the greatest number of recorded weed species is along major roads traversing drainage lines or rivers, and within pastoral stations and areas containing settlements with relatively high levels of disturbance and vehicular traffic. It is unknown to what extent this is a real pattern or a sampling artefact. However, taking these data on their face value the catchments of Little Towns River, Towns River, Limmen Bight River, Rosie Creek as well as the coastal port have identified records of serious weeds. It is very important for WDRL to manage these areas to prevent weeds being exported from them into relatively weed-free areas such as Pine Creek, Bing Bong Creek, Nathan River, Magarayngi Creek and Cox River during the stages of establishment, operation and decommissioning.

Using the NT Weed database data and the incidental records outlined above the spatial location of known declared weeds was mapped. These results are stratified by catchment (see Table 3; Figure 6). A number of catchments including Pine Creek, Bing Bong Creek, Nathan River, Magarayngi Creek and Cox Stream upstream have no known weed records. Existing weed records within the Rosie Creek catchment show that Bellyache Bush *Jatropha gossypifolia* (Class A) is located upstream from the population surveyed by EcOz at Rosie Creek along the proposed haul road route.

Table 1 The status of exotic plant species with the potential to inhabit and impact the project area.

Species Name	WONS	EPBC Search	NT Atlas Records		EcOz Survey	Holtz Records LNP (prev boundaries)	NT Weed Dataset
			MLAs and Haul Road	Bing Bong			
Declared Weed Class A - To be eradicated	4	4	1	0	1	1	5
<i>Acacia nilotica</i> subsp. <i>indica</i>	x	√	-	-	-	-	-
<i>Andropogon gayanus</i>		√	-	-		-	-
<i>Cryptostegia grandiflora</i>	x	-	-	-	-	-	√
<i>Jatropha curcas</i>		-	-	-	-	-	√
<i>Jatropha gossypifolia</i>		-	-	-	√	-	√
<i>Parthenium hysterophorus</i>	x	√	√	-	-	√	√
<i>Prosopis</i> spp	x	√	-	-	-	-	-
<i>Ziziphus mauritiana</i>		-	-	-	-	-	√
Declared Weed Class B - Growth and Spread to be controlled	3	1	6	5	3	5	12
<i>Alternanthera pungens</i>		-	-			-	√
<i>Cenchrus echinatus</i>		-	√	-	-	√	
<i>Hyptis suaveolens</i>		-	√	-	√	√	√
<i>Lantana camara</i>	x	-	-	-	-	-	√
<i>Lantana</i> spp		-	-	-	-	-	√
<i>Leonotis nepetifolia</i>		-	-	-	-	-	√
<i>Parkinsonia aculeata</i>	x	√	-	√	√	-	√
<i>Pennisetum polystachion</i> subsp. <i>Indeterminate</i>		-	√	-	-	-	
<i>Senna alata</i>		-	√	-	-	-	

Species Name	WONS	EPBC Search	NT Atlas Records		EcOz Survey	Holtz Records	NT Weed Dataset
			MLAs and Haul Road	Bing Bong		LNP (prev boundaries)	
<i>Sida acuta</i>		-	-	√	√	√	√
<i>Sida cordifolia</i>		-	√	√	-	√	
<i>Sida rhombifolia</i>		-	-	√	-	-	
<i>Stachytarpheta</i> spp		-	-	-	-	-	√
<i>Stachytarpheta cayennensis</i>		-	-	-	-	-	√
<i>Tamarix aphylla</i>	x	-	-	-	-	-	√
<i>Themeda quadrivalvis</i>		-	-	-	-	-	√
<i>Tribulus terrestris</i>		-	√	√	-	√	
<i>Xanthium occidentale</i>		-	-	-	-	-	√
Non-Declared Weeds – Environmental Weeds		1	25	7	5	31	4
<i>Aerva javanica</i>		-	-	√	√	-	-
<i>Aeschynomene americana</i>		-	√	-	-	-	-
<i>Aeschynomene villosa</i>		-	-	-	-	√	-
<i>Alternanthera dentate</i> cv. <i>indeterminate</i>		-	√	-	-	-	-
<i>Alternanthera dentata</i> cv. <i>Rubra</i>		-	-	-	-	√	-
<i>Alysicarpus ovalifolius</i>		-	√	-	-	-	-
<i>Alysicarpus vaginalis</i>		-	-	-	-	√	-
<i>Amaranthus viridis</i>		-	√	-	-	√	-
<i>Annona squamosa</i>		-	-	-	-	√	-
<i>Aristolochia elegans</i>		-	√	-	-	-	-
<i>Azadirachta indica</i>				-	-	-	√
<i>Bidens bipinnata</i>		-	-	-	√	-	-
<i>Bidens pilosa</i>		-	√	-	-	√	-
<i>Calotropis procera</i>		-	-	-	-	-	√
<i>Cenchrus ciliaris</i>		√	-	-	√	-	-
<i>Chloris barbata</i>		-	-	√	-	-	-
<i>Cenchrus setosus</i>		-	-	-	-	√	-
<i>Chloris Inflata</i>		-	-	-	√	-	-
<i>Clitoria ternatea</i>		-	-	-	-	√	-
<i>Corchorus olitorius</i>		-	√	-	-	√	-
<i>Crotalaria goreensis</i>		-	-	-	-	√	-
<i>Cynodon dactylon</i> var. <i>Dactylon</i>		-	√	-	-	√	-
<i>Cynodon radiatus</i>		-	√	-	-	√	-
<i>Cyperus involucratus</i>		-	√	-	-	√	-

Species Name	WONS	EPBC Search	NT Atlas Records		EcOz Survey	Holtz Records	NT Weed Dataset
			MLAs and Haul Road	Bing Bong		LNP (prev boundaries)	
<i>Dactyloctenium aegyptium</i>		-	-	-	-	√	-
<i>Digitaria bicornis</i>		-	√	-	-	√	-
<i>Digitaria ciliaris</i>		-	-	-	-	√	-
<i>Echinochloa colona</i>		-	√	-	-	√	-
<i>Eleusine indica</i>		-	√	-	-	√	-
<i>Eragrostis amabilis</i>		-	√	-	-	√	-
<i>Euphorbia heterophylla</i>		-	-	-	-	√	-
<i>Euphorbia hirta</i>		-	-	-	-	√	-
<i>Gomphrena celosioides</i>		-	√	-	-	√	-
<i>Indigofera hirsuta</i>		-	√	-	-	-	-
<i>Macroptilium atropurpureum</i>		-	√	√	-	√	-
<i>Malvastrum americanum</i>		-	-	-	-	√	-
<i>Melia azedarach</i> var. <i>Australasica</i>		-	√	-	-	-	-
<i>Mitracarpus hirtus</i>		-	-	-	-	√	-
<i>Passiflora foetida</i>		-	√	√	√	√	-
<i>Pennisetum pedicellatum</i>		-	-	-	-	-	√
<i>Physalis angulata</i>		-	√	√	-	-	-
<i>Portulaca pilosa</i> subsp. <i>Indeterminate</i>		-	√	-	-	-	-
<i>Rottboellia exaltata</i>		-	-	-	-	-	√
<i>Stylosanthes hamata</i>		-	√	-	-	√	-
<i>Stylosanthes humilis</i>		-	√	-	-	√	-
<i>Stylosanthes viscosa</i>		-	√	-	-	√	-
<i>Tamarindus indica</i>		-	√	-	-	√	-
<i>Tridax procumbens</i>		-	-	√	-	-	-
<i>Urochloa mosambicensis</i>		-	-	-	-	√	-
Total Species: 75 Class A weed - 8 Class B weed- 18 WoNS -7	7	6	32	12	9	37	21

LNP=Limmen National Park; Note: All species declared as weeds under *Class A* and *Class B* also belong to *Class C* i.e. not to be introduced into the Northern Territory

Table 2 The status of exotic plant species observed by EcOz within the project area

Weed Species	Declared Class (NT)	WONS	Mine Site & Camp Area	Cox River Crossing	Limmen Bight River Crossing	Nathan River Crossing	Rosie River Crossing	Pine Creek Crossing	Bing Bong Creek Crossing	Bing-Bong
<i>Parkinsonia aculeata</i>	Class B/C	x		–	–	–	–	–	–	Well established on the edge of a semi-permanent freshwater swamp as well as on the coast adjacent to the existing port facility
<i>Cenchrus ciliaris</i>	Non declared			–	–	–	–	–	–	Small infestation along road sides in disturbed sand piles
<i>Passiflora foetida</i>	Non declared			–	Low infestation on East bank	–	–	–	–	Widespread infestation throughout the coast vine thicket vegetation
<i>Aerva javanica</i>	Non declared			–	–	–	–	–	–	Small infestation along the road sides
<i>Hyptis suaveolens</i>	Class B/C			–	Well established (30m x 30m) patch on East bank	Well established (100m x 20m) patch on West bank	Large infestation on west bank	–	–	Large infestation in chenier's (old beach ridge) and some lowland coastal plains
<i>Bidens bipinnata</i>	Non declared			–	–	–	–	–	–	Scattered Individuals
<i>Chloris inflata</i>	Non declared			–	–	–	–	–	–	Scattered Individuals
<i>Sida acuta</i>	Class B/C			–	–	Low infestation on West bank	–	–	–	Scattered Individuals
<i>Jatropha gossypifolia</i>	Class A/C			–	–	–	Low infestation (10m x 10m patch) on west bank	–	–	–
Note: WONS - Weeds of National Significance as identified in Revised National Weed Strategy. Class A - To be eradicated Class B- Not to be Introduced into the Northern Territory Class C- Spread to be controlled										

Table 3 Location of declared weed species records in relation to the project area

SPECIES NAME	Weed Class	Catchment	Recorded Occurrence within Catchment
<i>Hyptis suaveolens</i>	Class B/C	Little Towns River	Upstream of Project area
<i>Sida acuta</i>	Class B/C	Little Towns River	Upstream of Project area
<i>Hyptis suaveolens</i>	Class B/C	Towns River	Downstream of MLA's and Haul Road
<i>Hyptis suaveolens</i>	Class B/C	Cox River	Downstream of Haul Road
<i>Hyptis suaveolens</i>	Class B/C	Limmen Bight River	Upstream of Haul Road
<i>Cenchrus echinatus</i>	Class B/C	Limmen Bight River	Upstream of Haul Road
<i>Sida acuta</i>	Class B/C	Limmen Bight River	Upstream of Haul Road
<i>Leonotis nepetifolia</i>	Class B/C	Limmen Bight River	Upstream and downstream of Haul Road
<i>Xanthium occidentale</i>	Class B/C	Limmen Bight River	Upstream of Haul Road
<i>Parkinsonia aculeata</i>	Class B/C	Limmen Bight River	Downstream of Haul Road
<i>Parthenium hysterophorus</i>	Class A/C	Limmen Bight River	Downstream of Haul Road
<i>Jatropha gossypifolia</i>	Class A/C	Limmen Bight River	Downstream of Haul Road
<i>Jatropha gossypifolia</i>	Class A/C	Rosie Creek	Upstream and Downstream of Haul Road
<i>Leonotis nepetifolia</i>	Class B/C	Rosie Creek	Upstream of Haul Road
<i>Parkinsonia aculeata</i>	Class B/C	Rosie Creek	Downstream of Haul Road
<i>Parkinsonia aculeata</i>	Class B/C		Port Area
<i>Themeda quadrivalvis</i>	Class B/C		Port Area
<i>Ziziphus mauritiana</i>	Class A/C		Port Area
<i>Stachytarpheta spp.</i>	Class B/C		Port Area
<i>Alternanthera pungens</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Cryptostegia grandiflora</i>	Class A/C	McArthur River	Upstream from Bing Bong port
<i>Jatropha curcas</i>	Class A/C	McArthur River	Upstream from Bing Bong port
<i>Jatropha gossypifolia</i>	Class A/C	McArthur River	Upstream from Bing Bong port
<i>Lantana camara</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Lantana spp.</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Parkinsonia aculeate</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Sida acuta</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Stachytarpheta cayennensis</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Stachytarpheta spp.</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Tamarix aphylla</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Themeda quadrivalvis</i>	Class B/C	McArthur River	Upstream from Bing Bong port
<i>Xanthium occidentale</i>	Class B/C	McArthur River	Upstream from Bing Bong port

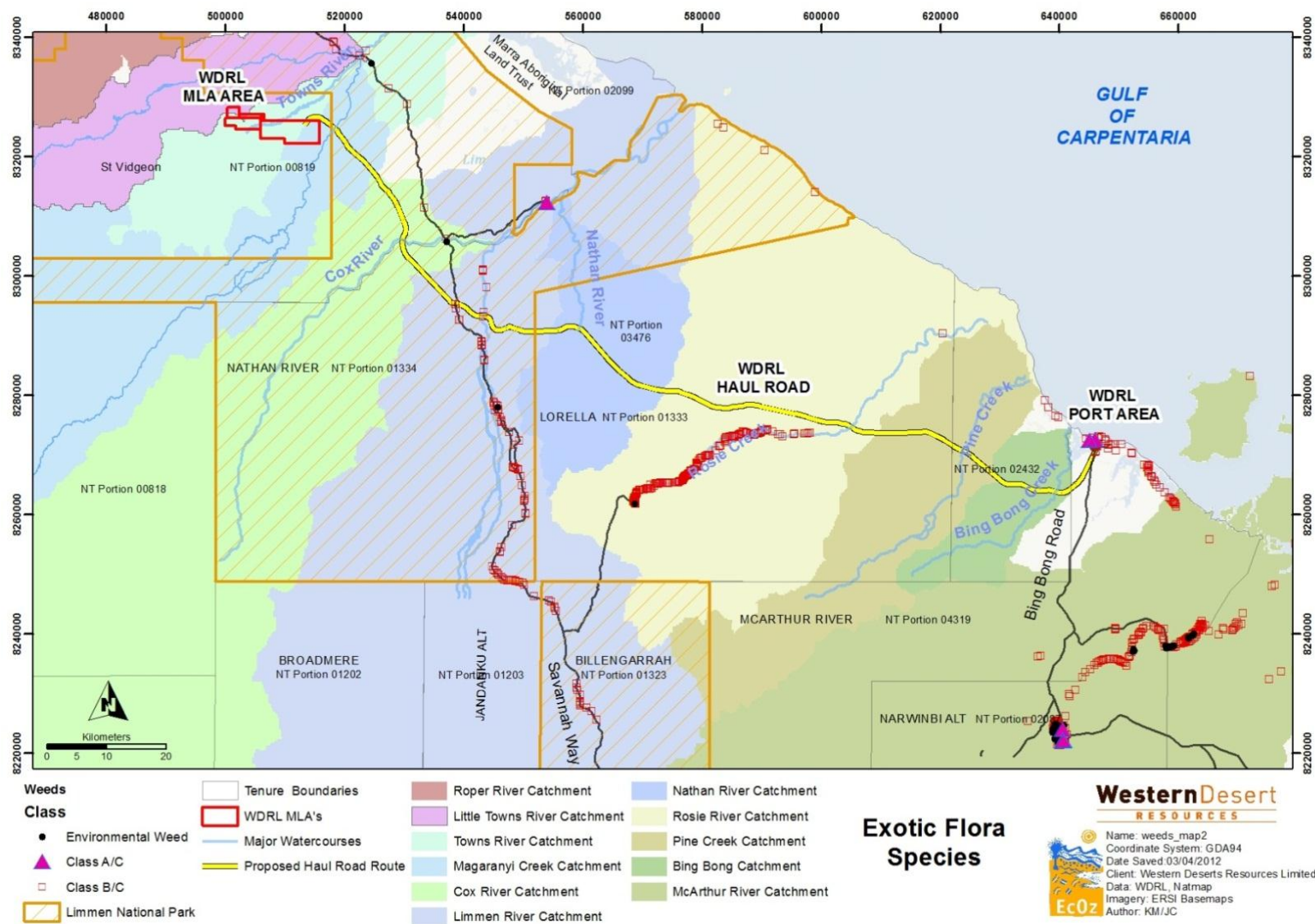


Figure 6 Exotic flora records in relation to the project area

3.2 Feral Animals

The proposed project area is known to be occupied by seven feral animal species. These include Cane toads, Cattle, Swamp Buffalo, Donkeys, Horses, Cats and Pigs (Table 4). Incidental occurrences of these animals have been reported primarily around watercourses with some degradation in areas of riparian habitat.

Desktop studies show that the highest number of records has been observed concentrated primarily around Nathan River Station. Known locations of these animals are shown in Figure 7. These animals occurrence has been recognised as a threatening process to existing biodiversity values.

WDRL will ensure that its activities will not introduce novel or augment existing populations of pest animal.

Table 4 Exotic pest species surveyed within the project area

Species Name	EcOz Survey Areas			Desktop Search	
	Mine Area	Haul Road	Bing Bong Port	EPBC Protected Matters Search Tool	NT Atlas Fauna Dataset
Amphibian					
<i>Chaunus marinus</i> Cane Toad	√	√	√	√	√
Mammal					
<i>Bos taurus</i> Cattle	-	-	√	√	√
<i>Bubalus bubalis</i> Swamp Buffalo	√	√	-	√	√
<i>Equus asinus</i> Donkey	√	-	-	-	-
<i>Equus caballus</i> Horse		√	-	√	√
<i>Felis catus</i> Cat	-	-	-	√	√
<i>Sus scrofa</i> Pig	√	√	-	√	√

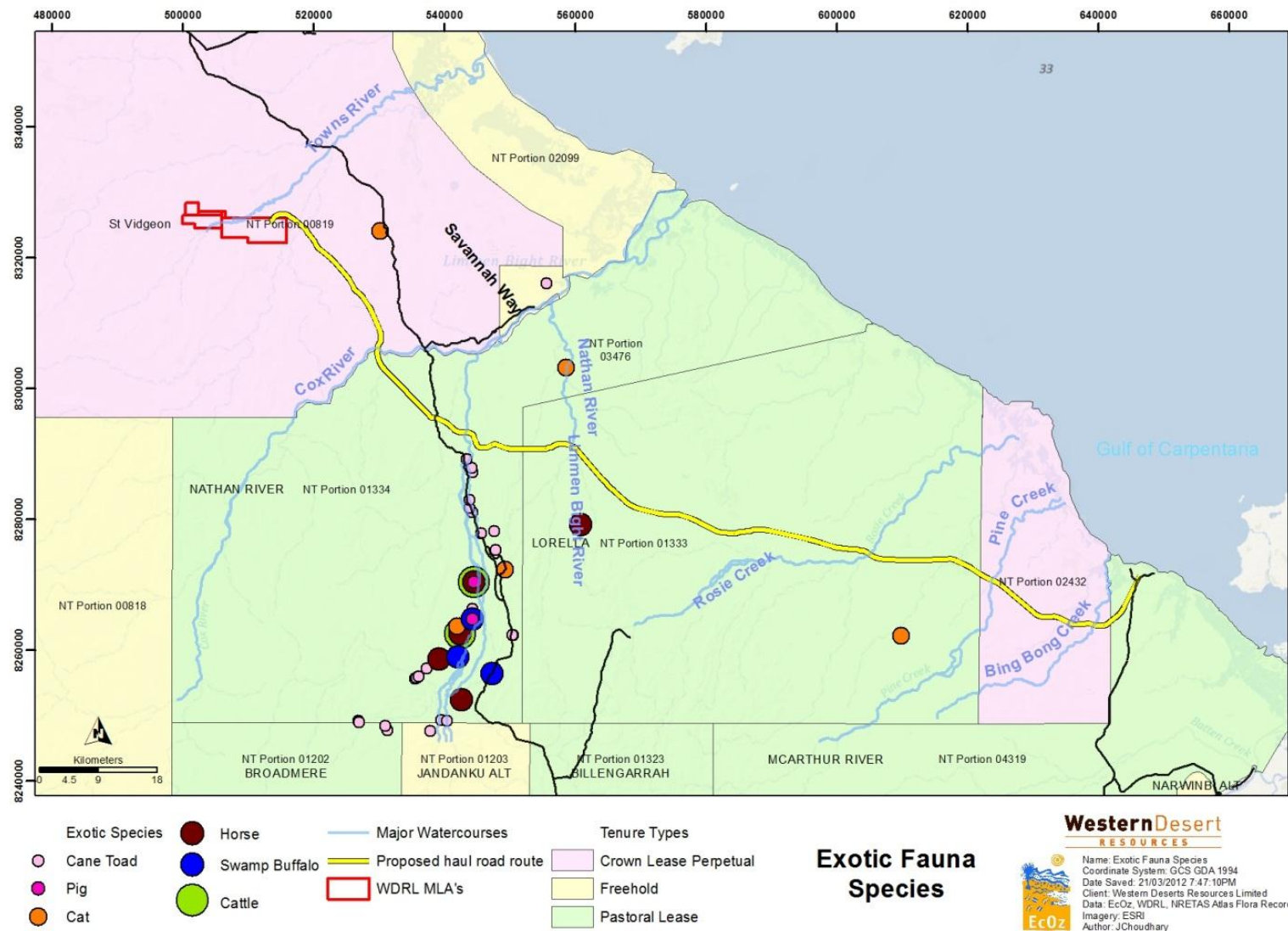


Figure 7 Exotic fauna records in relation to the project area

4 Risk of Weed and Pest Invasion

4.1 Weed Risk

The construction stage of the proposal will involve significant ground disturbances potentially allowing for the establishment of weeds. The construction of the haul road could potentially increase the opportunity for weeds to spread along the route through the frequent movement of heavy machinery and vehicles within and adjacent to unknown infestation areas, as well as with road maintenance activities such as grading and slashing. In addition to ground disturbance, other factors such as discharge of water and general poor management may also increase the opportunity for these plants to become prolific by providing an additional nutrients, moisture or disturbance. The desktop study on weed distribution has identified major infestations concentrated around waterbodies which are likely to spread within relatively weed-free areas (including aquatic environments) during the construction stages of the project as the result of significant disturbance from clearing and vehicular movement, unless weed hygiene protocols are incorporated into works activities.

During the operational phase the potential for weed dispersal for the haul road and port area will be relatively low as there will be little ground disturbance and haul vehicles will be travelling on a sealed road. Due to ongoing soil disturbance weed risk at the mine site and subsequent rehabilitation activities will be relatively higher.

Identification of environments degraded with weeds are a high priority to prevent the associated impacts given in Table 5 and ensure appropriate management. Weed threats will be prioritised by the weed species, size of infestation and location. Generally high priority weeds (weeds declared as Class A) pose a significant impact on land use when compared to medium priority weeds (declared Class B) and low priority weeds (declared Class C and Environmental weeds). Severity of these impacts can be reduced by implementing recommended control measures.

4.2 Pests Risk

Pests aggregate at sites where resources are available. These animals are likely to move into temporary (during the construction phase) and permanent (during the life of project) camp areas for food and water. It is difficult to keep feral animals out of the entire project area; however WDRL aims to discourage their movement into development areas via implementing industry best practices.

Besides the terrestrial pest issue, there is a huge threat to Australia's marine environment, fishing, aquaculture and tourism industries and recreational values from the introduction of marine pests through Ocean Going Vessels (OGV). All OGV entering Australian waters from overseas can potentially bring in a new pest species either by the pest attaching itself to the hull or other equipment or in the ship's ballast water. These introduced pests can spread easily to new locations by attaching themselves to any vessel including yachts, fishing boats and commercial ships. Chapter 3 talks about these issues in more detail.

Table 5 Impacts associated with weed infestations

Environmental Impact	• Competition with native species for water and nutrients • Toxicity to native animal • Reduction of biodiversity • Degradation of water quality (with soil erosion and aquatic weeds) • Increased risk of Fire • Unstable soil layer and increased erosion potential • Degradation of land conditions • Altered ecosystem
Economic Impact	• Cost of survey and control • Loss of ecotourism values • Loss of land productivity
Social Impact	• Degradation of recreational values • Impact on human health (such as allergic reactions –dermatitis and rhinitis or asthma on contact with the plant or its pollen) • Risk to safety

5 Weed and Pest Management Plan

This WPMP establishes the objectives, management requirements and management actions to mitigate and manage the potential impacts that could arise from the introduction and increase in abundance of weed and pest species within the project area (inclusive of the proposed mine area, haul road and coastal port).

This plan has been prepared for the entire project area with the view to achieve the following specific objectives over the long term:

- Ensure no new weed or pest species are introduced;
- Ensure the abundance and extent of existing weed species are reduced; and
- Maintain and enhance the biodiversity values of the site

WDRL has both a legislative requirement and a general environmental duty of care to take all reasonable and practicable measures to prevent and minimise any harm to the environment resulting from their operations. Weed control and pest management is identified as a key responsibility that will ensure improvements in existing land conditions and conservation of healthy functioning ecosystems.

A robust monitoring plan has been developed in order to facilitate ongoing identification of potential environmental impacts that may arise and long term effective management of these issues. All activities identified as responsible for introducing and spreading weeds and pest animals will be subject to control. An integrated weed control approach including control methods (physical and chemical control), a range of land management techniques (such as burning and revegetation) and prevention of spread (such as hygiene procedures) has been developed as a precautionary approach to eliminate the potential environmental impacts and achieve management goals. Weed control will be integrated into other programs such as land rehabilitation.

It should be noted that this plan has been developed without a baseline weed study and therefore a targeted weed plan aiming to manage the high risk areas cannot be prepared. However, this will be carried out after approvals have been given and prior to construction activities taking place.

Prevention is the most cost-effective method to control the infestation of weeds and pests within the project area and their associated damage to the environment. This will be an important part of WDRL's long-term planning.

Common methods of weed introduction include:

- Movement of contaminated machinery, vehicles, equipment, grass-slashers, into weed-free areas;
- Importation of contaminated landscaping and construction material into weed-free areas;
- Spreading of contaminated gravel, roadfill, topsoil;
- By animals (both feral and domestic) on fur, skin, feathers, fleece, through ingestion and possibly in the crops of birds;
- Plants or seedlings purchased from the nurseries or distributed through landcare programs to be used in the site rehabilitation;
- Intentional introductions such as improved pasture species;

Common methods of pest introduction include:

- Inappropriate management of excessive water;
- Inappropriate management of waste;
- Camp establishment and activities;
- Entrance of contaminated OGV into Australian Waters

Means of weed and pest introduction are not limited to these sources given above. WDRL will implement the control of these activities to ensure the prevention of weeds and sustained reduction of feral animals within the project area.

5.1 Pest Control – Control of pest introduction

It is difficult to control the feral animal populations within the entire project area due to it being a significant area of land which was previously utilised as pastoral land. WDRL will develop the water and waste management procedures to control pest disturbances in new areas, especially around the camp areas (both temporary and permanent). These procedures will be put into practice throughout the life of project, commencing with the establishment phase. Water management procedure will focus on avoiding the creation of artificial water points that could provide a source of drinking water to vertebrate pests or breeding habitat for invertebrate pests.

Waste management procedures will predominantly focus on reducing access of food waste to pest species. Domestic solid wastes will be disposed of on-site within a landfill trench. The waste pit will be fenced and burnt off regularly to exclude scavenging animals. Wastes will be periodically covered with 150 millimetres of waste rock at least once per month and revegetated once the trench is filled. Wastes from barges will also be disposed of at the licenced sewage waste facility at Bing Bong.

Preventing the introduction of exotic marine pests into Australian waters is a mandatory requirement and will be carried out in accordance with best practice and Australian Quarantine Inspection Service (AQIS) requirements with respect to the management of ballast water. Where feasible, all ships from international ports will exchange ballast water outside of Australia's territorial sea under the *Quarantine Act 1908*. Any Ocean Going Vessels (OGVs) originating from foreign ports will be subject to best practice Quarantine Management to ensure the continued protection of Australia's native flora and fauna from introduced pest species and diseases. A hull inspection of vessels will be required, if these vessels are from overseas or have been outside of Australian waters in the previous 12 months. WDRL will also develop a monitoring program for identification of invasive marine pest species within Australian waters adjacent to the Bing-Bong port.

5.2 Weed Control - Controlled Clearing

Weeds are generally opportunistic and often germinate on bare ground denuded by mining disturbance. Controlling disturbance is important to reduce the area of ground susceptible to weed invasion. Clearing control measures will be implemented during construction and operation of the project to ensure that no unnecessary clearing is undertaken. The total area to be cleared for construction will be restricted to that approved. Prior to clearing, the boundary of the area authorised to be cleared will be identified and clearly marked to prevent construction vehicles impacting on adjacent undisturbed vegetation. Construction activities will be limited to designated areas.

5.3 Weed Control - Control of Imports

WDRL will adhere to the minimum standards required to control the imports of all material within the mine site and project construction sites so as to ensure that no weed species have been introduced into the area within the material.

All imported material such as construction material, landscaping material, infrastructure materials, ground disturbing equipment etc., will be purchased from the suppliers guaranteeing them weed free. All imported construction materials will be inspected for potential weeds prior to entering the site.

5.4 Weed Control – Sewerage Treatment

Weeds can thrive where nutrient rich effluent or sewerage is discharged into the environment. WDRL has acknowledged the requirement of Sewage Treatment Plants (STP) to treat the domestic waste generated from the mining camp and mine site. These systems will have the capacity to treat the entire domestic stream of both “black” and “grey” waste waters. The STPs will be installed and operated according to the Northern Territory Department of Health *Guidelines for Management of Recycled Water Systems* (2011).

In early stages of the project, septic tanks will be installed at each of the camps established for the construction of the haul road and will receive all waste water from the camps. After extended use, septic tanks will need to be pumped out. This will require the services of a waste disposal contractor, who will remove the effluent from site.

5.5 Weed Control - Washdown Facilities

Vehicles and machinery movement from infested areas to clean areas has been recognised as a major source of potential weed spread. The construction stage of the project poses a huge threat of weed invasion into non-impacted areas. WDRL has acknowledged the need for washdown facilities to be installed at strategic locations. Two prime locations for permanent washdown bays has been confirmed – first within the mine site near the plant area & camp, and second within the Bing Bong port near the conveyor system.

The strategic location of washdown bays during construction of the haul road has yet to be determined, and this will be done subsequent to the proposed pre-construction weed survey. This survey will determine the current extent of infested areas and potential for them to spread into weed-free areas. All these infested areas will be treated prior to establishment of the haul road. Site selection for washdown facilities will need to consider the severity of weeds within an area and the consequence of spread into non-degraded areas.

All known infested areas will be marked, and their location will be reported to the road contractor and field staff to assist them in the construction of the access route. These identified areas will be treated as per the suggested controls given below and managed prior to construction work or movement of construction machinery into these areas. WDRL will employ hygiene procedures to prevent outbreaks in new areas. All areas proposed for disturbance will be checked for possible weed infestation prior to any earthworks or machinery movement into new areas. If any seeded infestation is reported during this inspection, it will be buried a minimum 2ft underground in a location where there is no risk of re-disturbance. This trench will be compacted hard and will be left to revegetate. Follow-up surveys of the area will be carried out to identify any other associated impact.

Construction work will be undertaken from clean areas moving towards infested areas where possible. Only single entry/exit point for the mine site and construction sites will be established and maintained to reduce the ecological footprints of mine disturbance. All vehicles and machinery used in the construction of the project will be subject to thorough washdown and certification at designated locations prior to entrance into the mine area and after travelling through weed infested areas. WDRL will adhere to the *Queensland Checklist for Cleandown Procedures* and *Queensland Guideline for the Construction of Vehicle and Machinery Washdown facilities* for vehicle washdowns. WDRL will ensure that these washdown bays are well maintained and signposted.

All plants, vehicle and equipment will be inspected for potential weed vectors prior to their entry into construction and mine sites. These vehicles and plants will need to be certified weed-free and issued with a Weed Hygiene Declaration Form.

During the operation phase, the risk of weed spread along the haul road is recognised as minor. Establishment of the stabilised and sealed haul road will allow vehicles to enter and exit the mine site during all weather conditions, reducing the risk of carrying soil and/or weed seed(s) on or off the site. Vehicle operators will remain on the designated haul road and access tracks, and avoid driving through any weeds patches. Vehicles will be required to undergo wash-down procedures only when they leave the road and travel into weed infested areas or if vehicles travel through muddy areas on the access track or haul road.

It will be responsibility of vehicle/plant/equipment operator to maintain the washdown log for all washdowns completed and a weed inspector will be responsible to maintain a washdown register of all washdowns and vehicle/plant/equipment certifications completed at their allocated facility.

If washdown facilities built primarily for the use of road contractors and other contractors are left on the site for permanent use, all adjacent land users will be encouraged to use these facilities, particularly when muddy vehicles or vehicles have travelled through high risk areas.

5.6 Weed and Pest Control - Early Detection

Early detection and treatment is a cost-effective measure against the threat of widespread weed invasion. Once weeds become established, it is very expensive and sometimes virtually impossible to eradicate them. It is important to detect and control weeds early in their life-cycle before they produce seed.

Correct weed identification is an essential first step in developing a suitable strategy for weed control. Baseline knowledge on current weed abundance and diversity will be achieved during the proposed pre-construction survey that will be undertaken by a weed expert. Regular surveillance of highly sensitive environments will be continued to enable detection of early stage infestations (i.e. at immature stages) and treat them before they become a serious issue. All personnel, particularly field staff will be encouraged to report any incidental sightings to the Environmental Manager. A weed identification hand-book will be provided to field staff. Photographs of weed species known to be problematic in the area will be posted on noticeboards to assist employee with the identification of potential outbreaks around the project area. A training program will also be arranged to assist the field staff with the identification of high risk weeds and the immediate actions that they should undertake when they encounter a weed species. A proforma will be provided to field staff to maintain a standardised data collection approach; this is attached as Appendix F-1. Training on the importance of the proforma and how to use it will be conveyed to field staff. This proforma will be updated if required in future.

Where suspected weeds cannot be identified, they will be collected for identification by the Weed Branch. A whole plant specimen including roots will be collected. Plants will be sealed in a plastic bag to avoid the spread of seeds. A proforma will be filled at the plant collection site. When it is not possible to get a specimen to an expert within 24 hours, the plant will be pressed between sheets of newspaper and dried to prevent the specimen going mouldy. Alternatively, photographs of the living plant covering the whole plant will be used to help botanists identify the plant.

5.7 Weed and Pest Control - Surveying Susceptible Areas

Certain types of ecosystems are more prone to invasion by weeds than others. Knowledge on the accurate locations of highly susceptible areas will be developed from the results of a proposed pre-construction weed audit.

Regular surveillance of sensitive environments is essential to detect early modification of ecosystems as a result of weed invasion and increase in weed abundance, and facilitate the management of these areas as soon as possible.

The project area involves a significant proportion of land mass which is highly vulnerable to weed invasion. All land exposed to disturbance is susceptible to be infested with weeds.

The areas that will be investigated periodically for weed-infestations include –

- **Watercourses, particularly after floods** – This area includes the river crossings traversing the haul road, diverted creeklines (Towns River creekline) within the MLA's and associated floodplains;
- **Haul road and local tracks** – This area includes the 165km long proposed haul road connecting between the mine area and coastal port and other local accesses and associated sedimentation ponds designed to collect the runoff sediments (including any sort of contamination)
- **Mine area and associated sedimentation ponds**– This area includes the mass of land that will be exposed to clearing and earthmoving operations for the establishment of pits, storage areas, processing plant, ancillary infrastructure and local access;
- **Previous known weed infestation sites;**
- **Vegetation communities adjacent to construction and ongoing disturbance activity areas;**
- **Camp area and waste management sites (landfill site);**
- **The stockyard facility at Bing Bong port and associated sedimentation ponds;**
- **Rehabilitation areas;**
- **Boundaries with adjacent lands and along fence-lines; and**
- **Washdown bays**

Timing of the survey is also an important factor. Weeds proliferation and survival is influenced primarily by seasonal and climatic conditions, particularly rainfall. Therefore these areas will be frequently surveyed during and after the wet season.

Any new outbreak will be reported to the Weed Branch and advice will be taken from them to manage identified weeds.

A weed logbook will be maintained to keep records of each outbreak and document the success of control measures.

5.8 Weed and Pest Control - Education and Training Program

The key to successful weed management is awareness, rapid detection, and response.

WDRL will develop education and training programs to achieve sustainable land management through the collaborated efforts of all personnel and contractors. These programs will be promoted to increase the level of awareness in personnel and contractors on the issues associated with the weed and pest introduction, identified high risk areas (determined during the pre-construction survey) and importance of the Weed and Pest Management Plan. These programs will be developed in such a manner that will enable on ground personal to make more informed decisions on weed management in their area. Relevant, accurate and comprehensive information sources such as Weed Identikits and posters will be developed as part of this training program.

It will be the responsibility of the Environmental Manager to identify training and competency requirements for personnel under their control, and for ensuring that personnel have the requisite competencies, skills and training to carry out their assigned tasks. He/she will also be responsible for ensuring training records are maintained.

Pending the results of the preconstruction weed survey it may be found necessary to develop a program for liaising with nearby land owners, if weed issues have been recognised as impossible to resolve without the management of areas upstream of the project area. This program will be targeted to increase awareness about weed issues and the importance of their management. Nearby land users will also be encouraged to not import weed contaminated material into the area.

5.9 Weed and Pest Control - Co-operation

The primary responsibility for Weed management rests with WDRL but collective action is necessary from involved personnel, contractors, government and communities to achieve the objectives efficiently.

All field staff should comply with the weed hygiene protocols during their work and should report incidence of new outbreaks to the Environmental Manager with all required information addressed in the weed proforma. Incidental reporting of pests or feral animals within and around the mine site should also be recorded so actions can be developed to restrict their movement into new areas.

If results from the pre-construction weed audit verify a requirement to cooperate with the adjacent land users, WDRL will liaise with the land users and will encourage them to implement control measures on their land.

A section of the proposed haul road (approximately 50km) traversing through the St. Vidgeon and Nathan River Station is also the area of the new proposed Limmen National Park. This provides an opportunity for WDRL to manage weed control within these areas in collaboration with rangers and landcare groups, once this area is declared a National Park.

The proposal involves sharing of the currently single user coastal port area (Bing Bong port) to export the product to markets. Roadsides within this area are currently heavily infested with a number of declared weeds. This offers an opportunity for both companies, Xstrata and WDRL to manage the weeds within this area as a joint approach.

As previously stated, the baseline knowledge on weed abundance and diversity will be collected from the proposed pre-construction weed audit to ensure that all current weed infestations are reduced in size through the developed of approved strategies and control measures. Surveillance of these areas and other recognised sensitive environments identified during the pre-construction survey will be continued periodically to detect early changes within the environment in response to weed invasion which will require control measures to prevent their prolific growth.

The remote location of the project area and its vast area provide a challenge to maintain land in a weed free condition. A range of different control techniques will be employed that can be cost effectively incorporated into a flexible integrated control program suited to local conditions.

The integrated control approach used will be dictated by the type of weed occurrence, growth stage, size of infestation, the location of the infestation and current land use. This approach will use mechanical and chemical control measures to either eradicate or control the spread of weed species. These control activities will be prioritised to maximize the use of resources allocated and to take advantage of timing. Detail on these weed control options is included in the sub-sections below.

When prioritising individual areas of weed infestations, a number of aspects will be taken into consideration. These are -

- proximity to roads/tracks - infestations close to tracks get high priority
- proximity to drainage line/waterway - infestations close to drainage lines more likely to spread
- phase of invasion - early stages can be controlled more easily, so will get high priority
- size of infestation - smaller infestations can be controlled more easily, so will get high priority
- susceptibility to wind dispersal as well as prevailing wind direction - weeds growing in elevated areas or weeds with light seeds more likely to disperse
- proximity to the lease boundary - weeds close to boundaries get higher priority
- weeds ranking under the NT Weed Management Act - weeds ranked as Class A under weed management act will get high priority
- weeds status at national level (e.g. all weeds include in National Weed List will get high priority)

This prioritised ranking will provide the opportunity to manage these areas within the appropriate timeframe before they cause serious environmental harm. All areas recognised as infested with weeds during the pre-construction weed survey will also follow the same ranking system and weed infestation will be managed prior to the construction activities.

Identified weed species within this area will be actively managed as per specific controls given in Table 6 and Table 7. WDRL will contact the Weed Management Branch (of NRETAS) to be advised on the most effective practicable methods for management of specific weed concerns and to verify that the WDRL's planned strategy fit in with the overall weed strategy within the region.

5.10 Physical Control

Physical methods of weed control will involve physical or manual control of invaded land by various means such as grubbing, hoeing, hand pulling, mulching and slashing. This approach will be used only for those areas where early detection of weed plants has been possible. Table 6 provides options for physical weed control methods and their suitability. An appropriate selection of physical control methods will be made depending on the site conditions and access.

It will be ensured that potential weed vectors that can move propagules from a weed-infested site to an uninfested site such as machinery, vehicles, equipment and even footwear, is cleaned (i.e. weed-free) prior to moving to new sites.

Physical control of weed infested areas in early stages will provide benefits such as:

- It can often be applied with machinery or equipment that is readily available;
- It can be cost-effective;
- It does not usually affect non-target species;
- It is often relatively non-polluting to the environment; and
- It is often relatively non-toxic to the operator.

However, there are a few limitations associated with physical control methods as they can be non-cost-effective for larger areas, and the use of heavy machinery to remove weed plants may cause a loss in stability of the ecosystem resulting in poor structure soil and erosion.

Table 6 Physical weed control options

Non-Chemical Control <i>(Only applicable to early stage infestations –prior to seed set)</i>	
PHYSICAL REMOVAL Individual plants will be removed by hand or by using a mattock. Entire root mat will be removed and excess soil will be shaken from the root system to ensure the plant dies.	SUITABLE APPLICATION • Small Infestations; • Early Stage Infestations; • Sites with predominantly native vegetation; and • Species not effectively controlled with available chemicals
SLASHING OR MOWING Slashing or mowing will not eradicate the weed plant, but it can reduce the biomass (fuel load), decrease seed production and create opportunities for more desirable species to establish. Herbicide coverage of the plant emerged after slashing can be easily achieved, and this reduces costs and increases control effectiveness.	SUITABLE APPLICATION • Predominantly exotic vegetation; • Multiple weed species; • Larger outbreaks of certain weeds, particularly annuals that have a limited ability to shoot once cut, such as several thistle species. • Species without seed set; and • No limitations to access
PLOUGHING, GRADING OR SCRAPING Ploughing, grading or scarping weed plants will be managed using earthmoving equipment that turns over the	APPLICABLE SITUATIONS • Predominantly Exotic Vegetation;

soil, buries the weed beneath the soil providing a barrier against the sun and resulting killing of weeds, though effective long term removal may require multiple attempts and/or the implementation of other weed management options. These activities will not be commenced prior to the dry season, and be completed and/or stabilized prior to the following wet season. A permit will be obtained, if the management activities will result in the removal of native vegetation.	• Multiple weed species; • Species without seed set; and • No limitations to access
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From: NRETAS (2009)

5.11 Chemical Control

Chemical control involves the use of herbicides. Widespread use of herbicides is generally not regarded as a sustainable long-term practice in weed control; therefore other means for weed control will be prioritised to where they are cost-effective to eliminate the infestation. These chemicals will be used particularly for those areas that have widespread infestation of seeded plants (or premature plants) and where non-chemical measures are not successful to achieve the targets.

Only registered chemicals will be used to ensure strict compliance with the *Agricultural and Veterinary Chemicals Code Act 1994*. Weeds not listed on the herbicides labels will be sprayed after obtaining an off-label permit. These chemicals will be used according to the instructions provided on the label. Conditions such as wind speed and direction, the possibility of rain and proximity to waterways will also be taken into account when preparing to use herbicides. Some common methods of application are given in Table 7 with safety considerations and measures to maximise the performance of herbicides.

To maximise the effects of herbicides, spraying times will be dependent on available moisture in plant or/and soil, weather conditions and the time of day. Optimum treatment time for identified weeds is provided in Table 8.

Herbicide application within areas of large infestations will be carried out gradually starting at the edge and working progressive inwards. Nevertheless, linear infestation will be managed in a strategic manner. Small outbreaks of weeds, particularly annual and perennial grasses will be 'spot sprayed' with non-selective herbicide (glyphosate). Within areas of multiple infestations, treatments specific to species with a high abundance will be employed to avoid inadvertent spread and will be managed using selective herbicides (registered for specific weed and situation).

WDRL will promote a program to provide chemical handling training to field staff. Records of all chemical treatments will be stored in a logbook to evaluate the effectiveness of treatment.

Table 7 Chemical weed control options

Chemical Control – Herbicide Use According <i>Agricultural and Veterinary Chemicals Code Act 1994</i>, it is important to use registered chemicals (i.e. herbicides) only in accordance with the claims for use on the label. Most environmental weed applications are not listed on herbicide labels; in these cases it is necessary to obtain an off-label permit. SAFETY CONSIDERATIONS ▪ Read the label before opening the container and follow the instructions. ▪ Wear protective clothing as directed on the label. ▪ Wash hands after use and before eating or smoking. HOW TO ACHIEVE THE BEST PERFORMANCE FROM HERBICIDES ▪ Read and adhere to the information contained on herbicide labels. ▪ DO NOT spray in windy conditions to avoid drifting of herbicide spray droplets onto non-target vegetation. ▪ DO NOT spray the herbicide on plants undergoing heat and water stress. ▪ Spray the herbicide mixture at night, early in morning or late in afternoon to enhance the herbicide uptake

into the plant. ▪ Use a fine spray (preferred 110° nozzle) with low application pressure (50-200L/ha) for better coverage of the whole plant. ▪ Use herbicides on young plants when they are actively growing. ▪ Use good quality water to prepare a herbicide mixture and spray evenly on all parts of weed plants ▪ Follow manufacturer's recommendations before using any additives (wetting agents/oils) in spray mixtures so as to increase their effectiveness. ▪ Rotate herbicides with different modes of action (i.e. Residual, Contact, Systematic) to help delay the development of herbicide resistance.	
FOLIAR SPRAYING STEP 1 Dilute the selected herbicide with water at a specific rate and spray over the foliage to point of runoff (until every leaf is wetted, but not dripping). STEP 2 Blanket spray to treat areas completely infested with weeds using a boom spray from a tractor. STEP 3 Use a hose and handgun to spray solution from a herbicide tank and pump carried by a tractor or vehicle for large infestations that need targeted applications of herbicide STEP 4 Smaller infestations can be sprayed using a backpack/knapsack spray unit. STEP 5. Spot spraying to treat individual weed plants or areas that only have small clumps of weed infestations.	OTHER CONSIDERATIONS • The method is most suited to shrubs, grasses and dense vines less than 6 m tall so that complete coverage is achieved. • Advantages include quickness and economy. • Disadvantages include the potential for spray drift and off-target damage.
BASAL BARK SPRAYING STEP 1 Mix an oil-soluble herbicide in diesel and spray the full circumference of the trunk or stem of the plant. STEP 2 Ensure the entire circumference of the stem or trunk is sprayed or painted with herbicide solution from ground level to a height of 30 cm. STEP 3 Treat every stem or trunk arising from the ground.	OTHER CONSIDERATIONS • • Suitable for thin-barked woody weeds and undesirable trees. • An effective way to treat saplings, regrowth and multi-stemmed shrubs and trees. • Allows the herbicide to enter underground storage organs and slowly kill the targeted weed. • A good way to tackle inaccessible areas such as steep banks.
STEM INJECTION STEP 1 At the base of the tree drill holes at a 45 degree angle into the sapwood at 5cm intervals. STEP 2 Fill each hole with herbicide immediately after it is drilled.	OTHER CONSIDERATIONS • Plants should be healthy and actively growing. • Deciduous plants should be treated in spring and autumn when leaves are fully formed. • For multi-stemmed plants, inject below the lowest branch or treat each stem individually. • Herbicide must be injected immediately before the plant cells close (within 30 seconds) and translocation of herbicide ceases.
CUT STUMP STEP 1	OTHER CONSIDERATIONS • A delay of more than 15 seconds for water-based herbicides and one minute for diesel-soluble herbicides

Cut the plant off completely at its base (no higher than 15 cm from the ground) using a chainsaw, axe, brushcutter or machete (depending on the thickness of the stem/trunk). STEP 2 Spray or paint a herbicide solution onto the exposed surface of the cut stump emerging from the ground. STEP 3 It is imperative that the herbicide solutions are applied as soon as the trunk or stem is cut. STEP 4 It is only necessary to place the solution around the edge of the stump for trees with large circumferences.	between cutting and applying the chemical will give poor results. - Two operators working as a team can perform this method effectively. - The herbicide can be applied from a knapsack, or with a paint brush, drench gun or a hand spray bottle. - It is a good idea to use a brightly coloured dye in the solution to mark the stumps that have been treated. - This method has the appeal of removing the weed immediately, and is used mainly for trees and woody weeds.
CUT AND SWAB STEP 1 This method is similar to the cut stump method, but is suited to vines and multi-stemmed shrubs. STEP 2 Cut plant stems through completely close to the ground. STEP 3 Apply the herbicide immediately to the cut surface emerging from the ground via spray or brush application	OTHER CONSIDERATIONS - In the case of vines with aerial tubers, both ends of the cut stems must be treated with herbicide. An effective way of doing this is to hold both bunches of cut stems in a container of herbicide for 15 seconds after cutting, so that maximum translocation occurs to both ground and aerial tubers. - Extra care should be taken when doing this to ensure spillages do not occur.
STEM SCRAPER STEP 1 With a knife, scrape 15 to 30 cm of the stem to reach the layer below the bark/outer layer. STEP 2 Immediately apply herbicide along the length of the scrape.	OTHER CONSIDERATIONS - A maximum of half the stem diameter should be scraped. Do not ring bark. - Larger stems (>1cm) should have two scrapes opposite each other. - Aerial tubers should die with the plant when stem scraping is used. Those that fall from the plant in the scraping process need to be bagged. - Vines can be left hanging in trees after treatment.

Source: NRETAS (2009)

5.12 Biological Control

Biological control involves the use of insects or pathogens (diseases) that impact on the health of weeds. Biological control options for invasive weeds are limited.

WDRL will ensure that incidences of known infestations are reported to the Weed Branch and the decision will remain with them as to whether it is suitable to release insects or pathogens into weed populations.

5.13 Land Management

Land management is the cheapest and most sustainable form of weed control. This control measure aims to promote the growth of desirable species to compete with weed species. The following activities can be used in an integrated weed management plan as tools to help control weeds.

Rehabilitation is an important part of best management practices in the control of weed species. WDRL will ensure that all areas influenced by the mining disturbance are rehabilitated immediately when these areas become available. Revegetation will begin with the spreading of topsoil on the revegetation area so as to provide an endemic seed bank and soil microbes. Where possible, topsoil will be located from a new mining area to a revegetation area as soon as possible so as to promote and retain the biological value of the soil. It will be ensured that replaced topsoil is weed-free. Rehabilitation areas will be revegetated with plant species that are native to the local environment. Seeds of vigorous and competitive native plants and grasses will be

collected from local plants or local areas to out-compete weeds and reduce their number. Shallow seeding technique will be used to allow the desirable species to grow above the soil surface more quickly. Increased seeding rate and narrow row spacing (i.e. overplanting) of native species will ensure long term weed control within these areas.

Mulching is another way to alter the growing environment of weeds. This involves the application of mulch to provide a barrier between sunlight and weeds. Revegetation areas will be mulched to provide a physical barrier to weed emergence and to improve soil condition and moisture levels.

Where possible, areas of bare soil, exposed after the application of mechanical or chemical weed control, will be rehabilitated to reduce the likelihood of re-establishment of weeds on the site.

A buffer zone is a designated area which isolates weed species from adjoining weed-free areas. Buffer maintenance will reduce the amount of seed blowing or washing over boundaries.

Seed set within buffer zone will be prevented by chemical means, mechanical/physical means or controlled burning. Disturbed areas where native plants are desired will be revegetated with tube stock or direct seeding.

A buffer zone will be maintained on either side of haul road and tracks to ensure that vehicles and machinery carry no contamination into weed-free areas. These areas will be maintained through slashing and chemical controls which will create opportunities for more desirable species to establish.

Table 8 Weed control measures for known weed infestations

Weed Species	Risk Rating	Timing											
		No v	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Jatropha gossypifolia</i> Class A/C	High		NON-CHEMICAL APPLICATIONS: Chain, slash or rake. LAND MANAGEMENT ACTIVITIES: Fire to kill young Bellyache bush seedlings and improve access for other control methods. CHEMICAL CONTROL: Foliar spray of Metsulfuron-methyl 600 g/L at rate 10g / 100 L on seedling (individual or infestation) Foliar spray of Metsulfuron-methyl 600 g/L at rate 10g / 100 L on adult (infestation) Cut stamp or basal bark treatment with Fluroxypyr 200 g/L at rate of 3 L / 100 L (diesel) for adult (individuals)										
<i>Sida acuta</i> Class B/C	Medium		NON-CHEMICAL APPLICATIONS: Repeated slashing and cultivation; vigorous pasture competition CHEMICAL CONTROL: Foliar spray of 2, 4-D amine 625 g/L at rate 320ml/100L on seedling or adult (individuals or infestation) Foliar spray of Metsulfuron-methyl 600 g/L at rate of 10g/100L on seedling or adult (individuals or infestation)										
<i>Hyptis suaveolens</i> Class B/C	Medium		NON-CHEMICAL APPLICATIONS: Manual removal of all plant material and slashing to encourage competition from desirable species CHEMICAL CONTROL : Foliar spray of 2, 4-D amine 625 g/L at 320 ml / 100 L rate on seedling or adult (individuals or infestation) Foliar spray on Glyphosate 360 g/L at rate of 15 ml / 1L on seedling or adult (individuals or infestation)										

Weed Species	Risk Rating	Timing											
		No v	Dec	Jan	Feb	Mar	Apr	May	Ju n	Ju l	Au g	Se p	Oc t
Parkinsonia aculeata Class B/C (Declared weed of national significance)	Medium		-			NON-CHEMICAL APPLICATIONS: Blade-ploughing, stick-raking, bulldozing and chaining LAND MANAGEMENT ACTIVITIES: Fire to kill young and adult trees CHEMICAL CONTROL: Foliar spray of Triclopyr 300 g/L and Picloram 100 g/L at rate 350 ml / 100 L on seedling (individuals and infestations) Basal bark and cut stamp treatment with Triclopyr 240 g/L and Picloram 120 g/L at rate of 1 L / 60 L (diesel) on seedling or adult (individuals and infestations)							
Note: Green cells indicate optimum timing for treatment Class A - To be eradicated ClassB - Growth and spread to be controlled Class C: Not to be Introduced into the Territory Weed of National Significance declared under National Weed Strategy 1999													

Source: NRETAS (2009)

6 Ongoing monitoring and training

Ongoing monitoring is an essential part of a weed management strategy which will enable WDRL to monitor the success of the implemented actions and to confirm that there are no impediments to native flora and fauna from potential increased competition of weed or pest animals. Most weed control methods require follow up weed inspection in treated areas for long-term suppression of weeds. The monitoring of highly sensitive environments and known disturbed areas will continued throughout the life of project and will be reported annually in the Mining Management Plan (MMP) with records of all weeds incidence and their treatment.

This WPMP will be reviewed annually to monitor the effectiveness of the implemented management strategies and updated to new requirements.

WDRL will ensure that training on importance and requirement of this plan is provided to new personnel, and any updated changes in the plan are discussed with field staff.

7 Performance Indicators

Performance against weed and pest control measures will be assessed against the following –

- there is no new weed infestations within the project Area (MLA's, haul road, Bing Bong Port) as a result of construction and operational activities;
- there is no spread of weeds from infested areas to weed free areas;
- the haul road is restored to a state that minimises potential for weed colonisation from disturbed areas; and
- there is no net increase in the abundance or distribution of pest animal species in the project area

These performance indicators will be met by implementing control actions outlined in Table 9.

Table 9 Management Actions: General weed and pest controls

Project Phase	Objective	Action
Pre-construction	Identify the overall abundance and diversity of weed and pest species across the RBIO Project area and adjacent lands to ensure that all areas are managed correctly.	1. Conduct targeted weed survey after significant rainfall events, but no less than 1 month before construction. 2. Record the incidental occurrence of pests in the area during weed survey
	Prevent the spread of weeds within the proposed project area and adjacent land	1. Install cleaning washdown facilities at the strategic locations. 2. Advise all engaged employees and contractors on location of washdown facilities and weed hygiene protocols 3. Provide weed control contractors with a map showing the location of waterways and associated soaks and drains. 4. Treat all identified weed infestations at an appropriate time prior to any earthworks or machinery movement onto these sites, taking particular care that non-target species will not be at risk from the used controlled approach. 5. Stage weeds removal activities to minimise erosion and facilitate the establishment of native plant species. Use integrated weed management for effective weed control. 6. Develop procedures for management of solid and liquid wastes 7. Develop the education programs to train field staff
Construction - Ongoing	Ensure effective pest control is undertaken for the project area	1. Erect a fence around the mine site 2. Manage solid and liquid waste generated from camps at mine sites and temporarily established along the haul road. 3. Avoid creating artificial water points 4. Dump all the non-hazardous waste in a trench at designated locations which may be fenced if needed. Burn waste periodically to exclude scavenging animals
Construction - Ongoing	Ensure effective weed control is undertaken for the project area to prevent weed spread and minimise the impact to environment from weed control activities.	1. Inspect the construction site for weeds before movement of machinery into these areas. Encountered weeds will be subject to suitable control measures. Plants with seed heads will be buried in an area (approximately 2ft deep trench) not susceptible to re-disturbance. 2. Minimise the soil disturbance via clearing the area only required. Mark the areas prior to clearing 3. Ensure that all imported material to be used in site rehabilitation is weed-free. 4. Encourage all employees and other members of nearby communities to report sightings of weed species 5. Report any new sightings of weed infestations to the field manager. 6. Establish procedures for receiving and responding to reports. 7. Avoid moving through weed infestations. 8. Always work from weed-free areas towards weed infested areas 9. Remove any weed seed and plant parts adhered to clothes, socks and shoes, and dispose them appropriately to prevent their spread at non-contaminated sites. 10. Inspect and clean all vehicles including machinery when

Project Phase	Objective	Action
Construction – Ongoing		leaving weed-infested areas. This could be done by blowing, vacuuming or washing dirt and seed. - During the clear and grade, earthworks machinery and any vehicles entering the construction area must be washed and declared weed free by the inspector. - Where practicable, stabilise areas of bare soil either through establishing vegetation or by compaction/hardstand establishment. - Monitor existing weed populations by surveying every 6 months and eradicate or control new infestations. - Ensure follow-up control treatments. - Ensure appropriate management of solid and liquid wastes generated from mine camps and camps established during the construction along haul road. - Maintain washdown log books - Develop a Pest Management Plan - Manage a buffer area or windbreak around the mine site.
Operation- Ongoing	Ensure effective weed and pest control is undertaken	- Continue pest and weed control through management of solid and liquid waste. - Promote the education and training programs to make field staff aware any changes in the plan. - Periodic surveying of highly susceptible areas and areas previously controlled of weeds - Implement an integrated weed control approach - Undertake short term monitoring of weed control success within recently treated. - Maintain weed log books with all reported occurrences and treatments - Report all new outbreaks to the field manager - The field manager should ensure that he/she reports all new outbreaks to the Weed Branch. - Vehicles washdown is only required if vehicles leave the cleared pathway or pass through muddy area. - Maintain the washdown log book. - Revegetate disturbed areas after the control measures, if possible. - Review the effectiveness of WPMP annually for a period of five years.
Site Rehabilitation	Ensure outbreaks of weeds do not occur.	- Rehabilitate areas as soon as they become available. - Wash down all rehabilitation equipment prior to entry to the area under rehabilitation and upon completion of work. - Strictly no use of topsoil containing weed seeds or plants. - Treat the weed species on the land adjacent to the rehabilitation area to prevent spread. - Plant vigorous and competitive native plants that will out-compete weed. - Mulch the area to alter environments most suitable to weed emergence.

8 Roles and Responsibilities

Table 10 lists the roles and responsibilities of the personnel responsible for the management of Weeds and Pests.

Table 10 Weed and pest management roles and responsibilities

POSITION	RESPONSIBILITY
RBIO Project Manager	• Ensure that all declared noxious weeds are identified and eradicated as required by regulations • Ensure that this weed and pest management plan is implemented • Provide access to training for Site Manager
Field & Logistics Operation Manager	• Ensure that all personnel are aware of and adhere to these procedures • Inspect vehicles for seed and soil when entering site • Implement wash-down procedures • Maintain washdown logs. • Inspect individual component of waste treatment facility before directing treated material to other component • Undertake continued training in weed identification • Maintain and act upon Weed Control Register • Perform regular surveys to identify noxious weeds and undertake any control programs as necessary
Employees and Contractors	• Report any occurrence of noxious weeds and feral animals • Wash all vehicles and equipment before entering or leaving site

9 References

- Australian Weeds Committee 2007. Australian Weeds Strategy: A national strategy for weed management in Australia. Natural Resources Management Ministerial Council, Commonwealth of Australia.
- Commonwealth of Australia 2000. Environment Protection and Biodiversity Conservation Act. Commonwealth of Australia, Canberra.
- Commonwealth of Australia 2007. Quarantine Act 1908. Commonwealth of Australia, Canberra.
- Cowie, I. and Kerrigan, R. 2007. Introduced Flora of the Northern Territory. Natural Resources, Environment, The Arts and Sport, Northern Territory.
- Department of Agriculture, Fisheries and Forestry. Agricultural and Veterinary Chemicals (Consequential Amendments) Act 1994. Queensland Government.
- Department of Agriculture, Fisheries and Forestry. Biosecurity - Weeds, pest animals & ants. Queensland Government. At http://www.dpi.qld.gov.au/4790_11974.htm
- Department of Natural and Environment. Queensland Weed Seed Spread Project 2000 - Queensland checklist for cleandown procedures. Queensland Government.
- Department of Natural and Environment. Queensland Weed Seed Spread Project 2000 - Queensland Guideline for the Construction of Vehicle and Machinery Washdown Facilities. Queensland Government.
- Natural Resources, Environment, The Arts and Sport (NRETAS), 2009. Weed Management Handbook. Northern Territory Government.
- Natural Resources, Environment, The Arts and Sport. Weeds. Northern Territory Government. At <http://www.nretas.nt.gov.au/natural-resource-management/weeds>.
- Northern Territory of Australia 2001. Weeds Management Act. Northern Territory of Australia, Darwin.
- Northern Territory of Australia 2007b. Territory Parks and Wildlife Conservation Act. Northern Territory of Australia. Darwin.
- Smith, N. 2001. Not from here: Plant invasions on Aboriginal lands of the Top End. Tropical Savannas Cooperative Research Centre, Darwin.
- Vertebrate Pests Committee 2007. Australian Pest Management Strategy- A national strategy for the management of vertebrate pest animals in Australia. Natural Resource Management Ministerial Council, Commonwealth of Australia.
- Walsh, D. 2008. From Athel Pine to Rubber Vine- Evaluating Northern Territory Weed Management Through Community Consultation. Greening Australia.

Appendix F-1: Weed proforma

Weed proforma

WEED NAME Genus & species	
COMMON NAME LOCAL NAME	
LOCATION	

LATITUDE(DMS/DD)	TEMP. PLOT No.
LONGITUDE(DD/DMS)	DATE
DATUM eg WGS 1984, GDA 1994, AGD 1966 AGD 1984	RECORDERS

LOCATION DESCRIPTION
SLOPE (%)
MOISTURE REGIME
SOIL TYPE
VEGETATION TYPE/DESCRIPTION
OTHER NOTES ie cultural notes, observations etc

WEED DENSITY H-heavy M-scattered to medium S-scattered U-undefined	Stages of weed growth present S-seedlings I-immature plants M-mature plantsadult D-dead plants
SIZE of UNITS M ² for square metres: Ha for hectares: Km ² for square kilometres	PLANTS SEEDING OR FLOWERING S-seeding F-flowering
WEED CONTROL MEASURES USED Include a. Weather conditions b. result of previous control measures c. weed—change in area, density, percentage kill d. regeneration—natives, which species e. action taken	

Source: Smith (2001)