



Fauna Management Plan

Health, Safety and Environment

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1 Purpose and scope

This Fauna Management Plan (FMP) outlines the management measures, strategies, standards and guidelines to be implemented to minimise impacts to native fauna (animals) on the Roy Hill Project. This plan is applicable to the operation of the Roy Hill Mine, Rail and Port project areas. It applies to works carried out within the Roy Hill project area. This includes all work carried out by Roy Hill and Roy Hill contractors and subcontractors.

Fauna management at the Roy Hill railway is required to comply with the Vertebrate Fauna Management Plan for Roy Hill Railway Corridor (VFMP) (100RH-3000-EN-REP-2009). The VFMP details relevant management and mitigation measures to be implemented during the construction and operation of the Roy Hill railway. The FMP (this document) expands upon the requirements outlined in the VFMP, specifically targeting the operations phase of the project.

The aims of this FMP are to:

1. Provide guidance to minimise direct and indirect impacts to fauna, including conservation significant fauna; and
2. Outline the specific standards, regulations or legislation that must be adhered to and inform the procedures associated with fauna management.

1.1 Objectives and Targets

The project environmental objectives and targets relating to fauna management are outlined in Table 1 below.

Objectives	<ul style="list-style-type: none">• To minimise the temporary and permanent reduction or fragmentation of existing fauna habitat• To minimise the direct impacts on fauna including through vehicle collision, entrapment in works areas, or extraordinary exposure to predators• To minimise disturbance to and mortality of all protected or conservation significant fauna within the site
Targets	<ul style="list-style-type: none">• No clearing has occurred outside GDP approved areas• No mortality of listed fauna of conservation significance• No impact has occurred to priority fauna habitat outside GDP approved clearing areas

Table 1: Fauna management objectives and targets

1.2 Project description

The Roy Hill Project involves a new iron ore mine, incorporating an ore processing plant, a 344 km heavy haul rail line from mine to port and new port facilities at the multi-user stockyard, south west of Port Hedland, Western Australia.

The Roy Hill mine is located approximately 110 km north of Newman and 277 km south of Port Hedland and is at the eastern end of the Chichester Range in the Pilbara region of Western Australia.

The ore deposit has more than 2.4 billion tonnes of iron ore resource with an expected mine operating life of approximately 20 years at a mining rate of 65 million tonnes per annum (mtpa), to produce approximately 55 mtpa of ore product.

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2 Legislative requirements

The construction and operation of the Roy Hill Project was assessed by Commonwealth and State regulatory agencies as having minimal impact to fauna (including conservation significant species) and its habitat (at a bioregional scale), providing adequate management measures and offsets are implemented. In addition, all employees and contractors of Roy Hill are legally obliged to comply with all relevant Commonwealth and State legislation including environmental legislation.

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key Commonwealth environmental legislation that requires referral of any activity that could potentially have a significant impact on any Matters of National Environmental Significance (MNES).

The status of the EPBC Act approvals for each project area is outlined below:

- Mine (Stage 1 and 2) – Referred and was determined to be ‘Not a Controlled Action’;
- Rail and Bonney Downs Realignment – Referred and was determined to be ‘A Controlled Action’ which was then approved (EPBC 2010/5424 and EBPC 2011/5867); and
- Port – Landside – Not referred as does not trigger any MNES.

The EPBC Act protects Australia's native species and ecological communities by identifying and listing species as threatened. Species of national environmental significance listed under the EPBC Act are classified as:

- Critically Endangered – If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future;
- Endangered – If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future; and
- Vulnerable – If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

Conservation significant fauna also include migratory species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA).

2.1.1 Rail

Condition 2 of EPBC Act approvals (EPBC 2010/5424 and 2011/5867) for the Roy Hill railway project requires Roy Hill to prepare and implement a Vertebrate Fauna Management Plan (VFMP; 100RH-3000-EN-REP-2009). The VFMP aims to maximise the ongoing protection and long term conservation of EPBC Act listed species along the alignment of the rail line during construction. EPBC Act listed species present within the Roy Hill railway area includes Greater Bilby (*Macrotis lagotis*), Northern Quoll (*Dasyurus hallucatus*), the Pilbara Olive Python (*Liasis olivaceus barronii*) and the Mulgara (*Dasyercus cristicauda*, *D. blythii*). The VFMP was developed and then approved by the Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment) on 3 January 2012.

The VFMP details management and mitigation measures related to construction and operations activities for the rail only. Specific measures, including the implementation of a fauna trapping and translocation program prior to clearing activities and clearing trenches of fauna prior to backfilling were put in place during the construction of the rail and associated infrastructure.

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The FMP (this document) and associated procedures detail the management and mitigation measures for operational activities at the Mine, Rail and Port. Relevant measures from the VFMP relating to operations have been incorporated into the FMP.

The Roy Hill Biological Sciences Team is to be contacted if construction activity is planned to be undertaken along the railway line during the operations phase. The Biological Sciences Team will advise if mitigation measures as outlined in the VFMP, and other requirements, will apply to the proposed construction activity.

Additional fauna management requirements relating to rehabilitation and design of borrow pits are contained within the Rehabilitation Management Plan (OP-PLN-00044), Rehabilitation Management Procedure (OP-PRO-00101) and Borrow Pit and Quarry Management Procedure (OP-PRO-00150).

2.1.1.1 Offset packages

Roy Hill has committed to the implementation of environmental offsets packages or programs, as required to meet EPBC Act approval conditions. These include a Threatened Fauna Offset Plan (TFOP) (Condition 3) and Contribution to Research (Condition 4) for EPBC 2010/5424, and the development and implementation of a Northern Quoll Research Plan (NQRP) (Condition 3) for EPBC 2011/5867.

As part of the TFOP, Roy Hill must take measures to protect and ensure the long term conservation of species of national environmental significance. Details of these ongoing measures and management actions are detailed in the TFOP (100RH-3000-EN-PLN-2005).

Contribution to Research is a commitment Roy Hill makes through an annual payment for ten years to the State Department of Parks and Wildlife (DPaW). These funds will be used by DPaW for the better protection and long term conservation of EPBC listed threatened fauna species in the Pilbara.

The NQRP (100RH-3000-EN-REP-2033) details the management, survey and research methods Roy Hill will implement to offset the impacts of the Roy Hill Railway on northern quoll and their habitat in the Chichester Ranges. Commitments include supporting and coordinating northern quoll surveys in the Chichester Ranges and contributing to the DPaW Northern Quoll Research Monitoring Program.

2.2 Environment Protection Act 1986

2.2.1 Mine

The Roy Hill mine proposal (Stages 1 and 2) was referred and assessed under Part IV of the *Environmental Protection Act 1986* (EP Act). The proposal was approved with conditions under Ministerial Statement (MS) 824 (approved December 2009) and MS 829 (approved March 2010).

Condition 9 of MS 824 required the protection and monitoring of the short range endemic (SRE) habitat sites within the project area for five SRE species; *Missulena* sp., *Synothele* 'MYG127', *Aganippe* 'MYG126', *Idiommata* 'MYG128' and *Beierolpium* sp.. MS 824 Condition 9 was modified to MS 902 Condition 9 in July 2012, after surveys in 2010, 2011 and 2012 (Ecologia 2010b, Bennelongia 2011 and Bennelongia 2012) located habitat for all but one of these species outside the mine project area. Condition 9 (of MS 902) requires the monitoring of SRE habitat sites outside the mining tenement every three years.

Condition 7 of MS 829 required the survey of the remote bore field pipeline route within 12 months of the approval being granted. The survey of this proposed alignment was undertaken by Animal Plant Mineral in December 2010 (Animal Plant Mineral 2010), which did not identify any conservation significant fauna. Should the pipeline alignment change from the proposed design, a new fauna survey is to be undertaken.

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2.2.2 Rail

The railway portion of the project was approved under MS 847. Condition 8 of MS 847 requires various management actions to be implemented relating to trapped fauna, particularly during trenching activities in the construction phase. These conditions are detailed as actions in the Fauna Management Procedure (OP-PRO-00134).

2.2.3 Port

The port infrastructure was assessed under MS 858. No specific requirements relating to fauna are required under MS 858.

2.3 Other legislation

2.3.1 Wildlife Conservation Act 1950

The *Wildlife Conservation Act 1950* (WC Act) states wildlife is protected. The WC Act also provides for species or subspecies of native animals to be specially protected and listed as 'threatened' in Western Australia. Details and definitions of these threatened and protected species are outlined below.

Threatened species are identified as either Declared Rare Flora (DRF) or Scheduled Fauna. Scheduled Fauna are listed in the *Wildlife Conservation (Specially Protected Fauna) Notice 2014*. There are four levels of Scheduled Fauna (1 to 4) as described below:

- Schedule 1 – being fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection;
- Schedule 2 – being fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection;
- Schedule 3 – being birds that are subject to an agreement between the government of Australia and the governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection; and
- Schedule 4 – are declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedule 1, 2 or 3.

Under the Regulations of the WC Act, Roy Hill is required to hold a 'Licence to Take Fauna for Scientific or Public Purposes' (Regulation 15 Licence) to allow fauna to be relocated away from operations or disturbed areas and a 'Reptile Removalist's Licence' (Regulation 17 Licence) to allow reptiles or amphibians to be relocated away from operations or disturbed areas. In order to hold these licences, only the personnel listed on the licences, who have been trained and deemed competent (and approved by DPaW) in fauna and reptile handling are authorised to capture / handle fauna. The Roy Hill Environment Team is responsible for the application and renewal of this licence, and any other licences, for Roy Hill, including the addition/removal of authorised persons from the licence. Specialist Consultants (e.g. Biologists or Ecologists) are an exception to this requirement; if consultants are engaged as part of an approved (by the Roy Hill Manager of Environment and Approvals or Superintendent Environment) study or program, they will have their own Regulation 15 or Regulation 17 licence(s).

Death of conservation significant fauna is required to be reported to DPaW as part of the Regulation 15 Licence data return. The data returns will be coordinated by the Roy Hill Environment Team.

The requirements of the WC Act and Regulations are detailed as actions in the Fauna Management Procedure (OP-PRO-00134).

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2.3.2 Animal Welfare Act 2002

The *Animal Welfare Act 2002* (AW Act) states no harm, cruelty or inhumane or improper treatment of animals is permitted. All actions and operations conducted as part of the Roy Hill Project must consider and provide for the welfare, safety and health of animals, including feral animals.

Fines for animal cruelty under the AW Act attract a minimum fine of \$2,000 to maximum fine of \$50,000 and imprisonment for 5 years. Cruelty to animals can include but is not limited to intentionally or recklessly poisoning, torturing, wounding, abusing, tormenting, or otherwise ill-treating an animal.

2.3.3 Biosecurity and Agriculture Management Act 2007

As a landholder, Roy Hill has a duty to control declared pests, including wild dogs, foxes and feral cats under Section 30 of the *Biosecurity and Agriculture Management Act 2007*. In line with AW Act, the capture, handling, treatment and euthanasia of feral animals is to be conducted in a humane manner with as little stress to the animal as possible.

2.4 Conservation Significant Species

Conservation significant species can be listed as species of national environmental significance (under the EPBC Act), as Scheduled Fauna (under WC Act) or as DEC Priority species (on lists held by DPaW, previously DEC).

Species that may be threatened or near threatened but are data deficient, have not yet been adequately surveyed to be listed under the WC Act (Scheduled Fauna or DRF), are added to the DEC Priority Fauna or Priority Flora Lists, under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Priorities 4 and 5 are allocated to species requiring monitoring. The definitions of Priority Fauna are described below:

- Priority one – Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one of a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened species;
- Priority two – Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna;
- Priority three – Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna;
- Priority four – Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened; and
- Priority five – Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

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Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in Western Australia is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority species have no statutory protection, other than DPaW wishes to monitor potential impacts on these species. However, Roy Hill still aims to protect where possible and provide information gained on priority species back to DPaW as part of good practice.

3 Existing environment

The Roy Hill project is located within the Pilbara Bioregion as described in the Interim Biogeographic Regionalisation for Australia (IBRA). The project is situated within both the Chichester and Fortescue Plains subregions (Ecologia 2008a).

3.1 Mine

The three major fauna habitats are present in the mining areas (Ecologia 2008a) are described as:

1. Hill Top and Slopes: Vegetation comprises sparse trees of *Acacia* sp., eucalypts and *Hakea* sp. over moderately dense *Triodia* sp. hummock grassland. This habitat occurs primarily on a single ridge line that runs north-south and is parallel and to the west of Marble Bar Road. It comprises low rounded hills, lacking gorges and cave systems characteristic of most ridge lines in the Pilbara. A set of small stony rises occurs in the south-east corner of the project area and this area supports mulga shrubland.
2. Mulga Plains: The majority of the study area is covered by flat plains supporting mulga woodland. The southern regions of the project area have been heavily grazed. Following summer rains, the understorey supported dense to open annual grasses and herbs.
3. Drainage Lines: The drainage lines (creeks and river beds) are fringed by Mulga woodland with or without *Eucalyptus camaldulensis* (River Red Gum) trees and *Acacia* spp. shrubs. This habitat has been severely degraded by cattle, with fringing vegetation destroyed by trampling and grazing and heavily infested by weed species (mostly Buffel Grass and Beggars Ticks).

Based on species distribution and habitat preferences, 33 native mammals, eight introduced mammals, 126 birds, 94 reptiles and nine frog species potentially occur in the mine area (Ecologia 2008a). No threatened fauna species (species listed under the EPBC Act or WC Act) have been recorded in the immediate Roy Hill mine area (Ecologia 2008a).

Subterranean fauna assessments have been carried out across the mine project area (SMEC 2009a and 2009b). The potentially significant stygofauna (aquatic subterranean animals) specimens are located outside the mine area and will not be directly affected by the project (SMEC 2009a). No true troglifauna (invertebrate species that breathe atmospheric oxygen) species have been identified (SMEC 2009a). Short range endemic (SRE) species are species with naturally small distribution ranges (usually less than 10,000 km²) (Harvey 2002). Many SRE's are terrestrial and aquatic invertebrates, including both surface and subterranean invertebrates. SRE surveys have been undertaken between 2006 and 2013, identifying or monitoring various SRE species (Ecologia 2006; 2008b; 2009a and 2010a, Bennelongia 2011a, 2012 and 2013).

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3.2 Rail

A number of broad fauna habitat types have been recorded within the Roy Hill railway (Phoenix 2011 and Terrestrial Ecosystems 2011a) and are listed below:

1. Spinifex grass plains on rolling stony hills: this area comprises the majority of the southern rail corridor
2. Spinifex grass plains: these areas are found predominantly on clay flood plains
3. Shrubs over spinifex grassland on a flat sandy plain
4. Mulga woodlands: limited to small patches in the southern rail corridor
5. Rocky slopes, hilltops and mesas: the majority of these areas are avoided by the railway line, however the bases of some are traversed by the alignment
6. Granite rock piles in a shrub and/or spinifex meadow
7. Major and minor creek lines and drainage lines: numerous creek and drainage lines intersect the rail alignment
8. Bare ground
9. Mud flats

Of these, the spinifex grass plains (on rolling stony hills) and creek lines/drainage lines provided the largest area of potentially suitable habitat for conservation significant fauna (Terrestrial Ecosystems 2011a).

The habitat quality along the rail corridor varies from highly degraded to high quality. Previous construction activity associated with the Fortescue Metals Group (FMG) rail line is obvious in many areas and some areas have been burnt by either natural fires or pastoralist burning (Terrestrial Ecosystems 2011a).

A Level 2 survey of the Abydos Plain section of rail alignment (between chainage 92-180) recorded 140 fauna species (12 mammal, 62 bird and 59 reptile, seven amphibian) (Terrestrial Ecosystems 2011b). Only three species recorded were of conservation significance; Rainbow Bee-eater (*Merops ornatus*; EPBC Act Migratory), Fork-tailed Swift (*Apus pacificus*; EPBC Act Migratory) and Australian Bustard (*Ardeotis australis*; DEC Priority 4) (Terrestrial Ecosystems 2011b).

A Level 2 systematic field survey of the Bonney Downs Alignment southern rail section (between approximate chainage 260-345) recorded 129 native vertebrate species (17 mammal, 62 bird and 46 reptile, four amphibian) (Phoenix 2011). Five of the 129 species recorded were of conservation significant species, including Western Pebble-mound Mouse (*Pseudomys chapmani*; DEC Priority 4), Australian Bustard, Peregrine Falcon (*Falco peregrinus*; WC Act Schedule 4), Rainbow Bee-eater, and Star Finch (*Neochmia ruficauda subclarescens*; DEC Priority 4) (Phoenix 2011).

The West Australian Museum database of potential SRE species in the vicinity of the Roy Hill project indicates that species occur in a variety of habitat types, including rocky outcrops, south and non-south facing slopes in the Chichester Range and woodlands along water bodies in the Roebourne plains. The railway corridor intersects areas of these habitats in several places and SREs potentially occur along several sections of the corridor, especially in the Chichester Range (Bennelongia 2011b).

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3.3 Port

The port (landside and marine) area is defined as the area north of the rail terminal yard (chainage 15 km), incorporating the port rail loop and port infrastructure (overland conveyor and wharf). The port area consists of the following habitat types (WorleyParsons 2012):

1. Grassland/sandy shrublands: These areas are common and widespread in the locality and may support potential SRE species and a range of terrestrial vertebrates.
2. Mudflats/Samphire: These areas are fringed by low open samphires and are generally hypersaline. They are unlikely to be utilised on a regular basis by terrestrial fauna.
3. Sandy Islands: These areas were scattered throughout the samphire flats, with vegetation occurring on elevated sandy islands.
4. Cyanobacterial mats: These occur in areas landward of the mangrove fringe. They can be considered ecologically important as they are an important part in the food chain of shore birds. The cyanobacterial mats near the project area do not appear to be particularly healthy.
5. Mangroves: These areas occur on the marine side of the port project area and will support various fish and crustacean species at high tide.

Vegetation within the port area is generally in very good condition, with recent fire and pastoral activities altering and shaping the vegetation (WorleyParsons 2012). Habitat suitable to support Mulgara, a species of conservation significance, was present as dense spinifex covering sandy soils, suitable for burrowing (WorleyParsons 2012). Two other species of conservation significance, Australian Bustard and Rainbow Bee-eater, could also be present. However, they are not reliant upon the habitat within the area as they can easily relocate to similar habitat in adjacent, unaffected areas (WorleyParsons 2012).

The tidal, mangrove-lined creeks of Port Hedland harbour represent foraging habitat for juvenile Flatback Turtle (*Natator depressus*; EPBC Act Vulnerable) and Green Turtle (*Chelonia mydas*; EPBC Act Vulnerable) (Pendoley Environmental 2008). Nesting sites for Flatback Turtles are known at Pretty Pool, Cooke Point and Cemetery Beach (Roy Hill 2010).

The mangroves may support specialist species such as the White-bellied Mangrove Snake (*Fordonia leucobalia*), Mangrove Robin (*Eopsaltria pulverulenta*) and Mangrove Golden Whistler (*Pachucephala melanura*). One species of conservation significance, the Little North-western Mastiff Bat (*Mormopterus loriae cobourgiana*; DEC Priority 1), has been recorded within mangrove habitat in the Utah Point area, adjacent to Roy Hill port infrastructure (PHPA 2010).

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Migratory birds which may occur within the vicinity of port area include (PHPA 2010, Roy Hill 2010, WorleyParsons 2012):

- Australian Painted Snipe (*Rostratula australis*);
- Caspian Tern (*Hydroprogne caspia*);
- Eastern Curlew (*Numenius madagascariensis*);
- Eastern Osprey (*Pandion cristatus*);
- Fork-tailed Swift (*Apus pacificus*);
- Oriental Plover (*Charadrius veredus*);
- Oriental Pratincol (*Glareola maldivarum*);
- White-bellied Sea Eagle (*Haliaeetus leucogaster*); and
- White-winged Black Tern (*Chlidonias leucopterus*);

The White-bellied Sea Eagle was observed during surveys within the Port area (Roy Hill 2010). The Osprey (*Pandion cristatus*) is also known to nest within the Port Hedland Port (PHPA 2012).

Further information about species within the port area can be found in the Marine Fauna Identification Guide (TBD).

4 Key Conservation Significant Species within the Roy Hill Project

Four conservation significant species recorded and/or suitable habitat identified are found within the Roy Hill Rail Project area, Table 2. Details on species distribution, description and key threats are included below for each EPBC listed species. Photos of each species and additional information can be found in the Significant Flora, Fauna and Weed Species Identification Guide (100RH-0000-EN-GUI-2004).

Species	Common Name	EPBC Act	Wildlife Conservation Act	DEC Priority	Project area
<i>Dasyurus hallocatus</i>	Northern Quoll	EN	Schedule 1		Rail
<i>Macrotis lagotis</i>	Greater Bilby	VU	Schedule 1		Rail
<i>Dasyercus cristicauda</i> , <i>D. blythi</i> *	Mulgara	VU*	Schedule 1	Priority 4	Rail
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	Schedule 1		Rail

EN = Endangered, VU = Vulnerable

Table 2: Conservation significant species found within the Roy Hill Project area

*At time of assessment, two species of *Dasyercus* (*D. cristicauda* and *D. blythi*) had recently been distinguished and the distribution and conservation status of each species remained unknown. Hence the Commonwealth Department of Environment assumed all Mulgara in the Pilbara were represented as *D. cristicauda* due to its higher level of statutory protection (*D. cristicauda* classified as Vulnerable; *D. blythi* classified as DEC Priority 4).

However, recent genetics and morphometrics and re-examination of all museum specimens in Australia have demonstrated that *D. cristicauda* is not found in the Pilbara. The Commonwealth Department of Environment (2014) Species Profile and Threats Database (but not yet DPaW's *NatureMap*) has been updated to indicate that only *D. blythi* is expected to occur in the Pilbara.

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4.1 Northern Quoll

In 2005, the Northern Quoll (*Dasyurus hallucatus*) was listed as an Endangered species under the EPBC Act due to a decrease in its distribution across Australia. Historically Northern Quoll extended across the northern third of Australia, but it is now reduced to small patches within Queensland, the Kimberley, Northern Territory and the Pilbara. In the Pilbara region, the Northern Quoll's distribution is considered fragmented, with records from four subregions; namely the Hamersley, Fortescue Plains, Chichester and Roebourne Plains subregions (Department of the Environment 2015a).

The Northern Quoll is one of the largest mammal predators in the Pilbara and is the smallest quoll species. They are a nocturnal, omnivorous species, feeding on large insects, small vertebrates and soft fruits. Northern Quolls are easily distinguished by white markings (spots) on its reddish brown fur, with a cream undersidebody (Department of the Environment 2015a). They also have a characteristic pointy snout (Department of the Environment 2015a). They are found in dissected rocky hills, escarpments, gullies and in eucalypt woodlands within the region.

Factors contributing to the decline of northern quoll include increases in cane toad, feral dog and cat populations, and habitat destruction from mining, other development and cattle grazing. A key threat to the Northern Quoll is the cane toad, the toxins of which kill Northern Quolls when eaten. Cane toads are predicted to reach all of the Northern Quoll's range in the next 10 to 20 years, except the Pilbara and western Kimberley regions. This makes any populations remaining in the Pilbara of particular importance (Hill & Ward 2010). The populations present in the Pilbara are also in competition with or suffering predation by the introduced European red fox. Other feral predators including feral cats also provide competition and predation pressure (Hill & Ward 2010).

4.2 Greater Bilby

Once widespread in arid and semi-arid regions across up to 70% of the Australia mainland, the Greater Bilby (*Macrotis lagotis*) is now confined to the deserts of central Australia. Its distribution ranges from the Tanami Desert in southern Northern Territory, the sandy deserts of Western Australia and the Pilbara, and small populations in the Channel Country and Mitchell Grass Downs of south-western Queensland (Pavey 2006, Johnson 2008).

The Greater Bilby is a large nocturnal marsupial closely related to bandicoots. It is a rabbit-sized marsupial that has long, soft, blue-grey fur over most of the body and white to cream on the belly. The Greater Bilby has characteristically large ears, a long pointed snout and a black tail with a white tip (Department of the Environment 2015b). The Greater Bilby occurs in a variety of habitats but its preferred habitats are spinifex grasslands, acacia shrublands, open woodlands and cracking clays (Johnson 2008). The Greater Bilby excavates burrows, and its distribution appears to be related to substrates suitable for burrow construction.

Drought, disease, trapping and distribution of poison baits for rabbit control reduced population numbers in years past, however the biggest current threat to the survival of the Greater Bilby is predation by the European fox (Abbott 2001). Clearing of habitat for grazing and fire are also potential threats (Southgate 1990).

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4.3 Mulgara

In 2005, Woolley redefined the Mulgara into two species, *Dasycercus cristicauda* (Crest-tailed Mulgara) and *D. blythi* (Brush-tailed Mulgara). The two species differ in tail morphology, teat number and premolar dentition (Woolley 2005). In recent publications the two taxa have been treated separately (Masters 2008, Woolley 2008, Menkhorst and Knight 2011). However until very recently (Department of the Environment 2014), the two taxa were thought to have overlapping distributions and be sympatric (occurring in the same place), and hence the Commonwealth treated all Mulgara as *D. cristicauda* (it had a higher level of protection, than *D. blythi*). Recent genetics and morphometrics and re-examination of all museum specimens in Australia have demonstrated that *D. cristicauda* is not found in the Pilbara (Department of the Environment 2014).

Both Mulgara species build complex burrow systems on the flats between low sand dunes or the slopes of high dunes where spinifex cover is low (Masters 2008, Woolley 2008). Crest-tailed Mulgara have an annual breeding cycle with only a single litter, making them particularly sensitive to changes in habitat and number of prey items.

Crest-tailed Mulgara are most threatened by predation by cats and European foxes (Department of the Environment 2014). However, fire, drought and cattle also threaten the survival of the species (Masters 1998), as they are sensitive to changes in their immediate environment, including habitat degradation.

4.4 Pilbara Olive Python

The Pilbara Olive Python (*Liasis olivaceus barroni*) is a large patternless python, grey to olive green in colour that is restricted to the Pilbara region, north-western Western Australia. The species is known from 17 locations, including Hamersley Range, islands of the Dampier Archipelago, Millstream, Tom Price and Burrup Peninsula (Department of the Environment 2015c; Pearson 1993). Pilbara Olive Python is often associated with watercourses or areas with permanent water, and is usually restricted to gorges and escarpments fringing water bodies.

Predation of juvenile pythons by European foxes and cats is suspected to be a problem for populations in the coastal Pilbara region. A reduction on prey items, by European foxes and cats also threatens the Pilbara Olive Python (Pearson 2003).

5 Potential impacts

5.1 Key activities

Many activities undertaken through operation and mine closure/decommissioning phases of the Roy Hill project have the potential to impact on the environment. Activities included but are not limited to the following activities:

- Vegetation clearing;
- Ground disturbance, including trenching and development of borrow pits;
- Vehicle movement;
- Train movement;
- Installation of linear infrastructure;
- Groundwater abstraction and distribution;
- Open pit mining; and

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- Rehabilitation.

5.2 Potential impacts

Project activities as part of the operation of the Roy Hill project may result in negative impacts to fauna. Discussion of the key impacts and management measures to reduce impacts to fauna are addressed in Section 6, and in the Fauna Management Procedure (OP-PRO-00134).

Direct impacts on fauna are likely to be associated with habitat loss and fragmentation, vehicle collisions, noise and vibrations and predation from increased feral animals. Other indirect impacts include decrease in biodiversity of significant vertebrate fauna, population fragmentation, fauna stress, fauna injury / mortality, reduction in available water sources / water quality and reduction in food sources.

6 Management

Risks identified as a threat to achieving the fauna targets and objectives have been identified for the project. Those risks relating specifically to fauna management are outlined in Table 3 along with the key documents which reference the management actions or strategies to mitigate these risks. See Section 0 for a list of relevant documents and their reference numbers.

Risk / Cause	Management Action / Control
Unauthorised disturbance or breach of clearing boundary	All ground disturbance is to be undertaken in accordance with the Ground Disturbance Permit Procedure (OP-PRO-00193).
Habitat loss and/or fragmentation	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134).
Impact on priority fauna habitat	All ground disturbance is to be undertaken in accordance with the Ground Disturbance Permit Procedure (OP-PRO-00193). All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134).
Loss of conservation significant fauna species	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134). If feral animal control is required, it must be undertaken in accordance with Feral Dog Baiting Work Instruction (OP-WIN-00013) and Feral Cat Trapping Work Instruction (OP-WIN-00017).
Injury or death to fauna	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134). If in relation to injured animals, fauna are to be handled in accordance with the Fauna Handling Work Instruction (TBD). If in relation to injured animals, fauna are to be euthanised by Roy Hill Environment personnel in accordance with the Euthanasia of Fauna Work Instruction (TBD). If in relation to injured animals located at Ginbata Aerodrome, fauna are to be reported following the Ginbata Aerodrome Wildlife Hazard Management Plan (100RH-0000-HS-PLN-2025).
Stressed fauna	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134). If in relation to stressed animals, fauna are to be handled in accordance with the Fauna Handling Work Instruction (TBD). If in relation to confined snakes, snakes are to be handled in accordance with the Snake Handling Work Instruction (OP-WIN-00114).

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Risk / Cause	Management Action / Control
Displacement of fauna and/or population fragmentation	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134).
Increase in feral animals	All works are to be in compliance with the Fauna Management Procedure (OP-PRO-00134). If in relation to increase in feral animals, and control of feral animals by Roy Hill staff is required, control methods must be undertaken in accordance with Euthanasia of Fauna Work Instruction (TBD) and Using a Firearm Procedure (OP-PRO-00062). If in relation to increase in feral dogs, feral dog baiting is to be undertaken in accordance with Feral Dog Baiting Work Instruction (OP-WIN-00013). If in relation to increase in cats, cat trapping to be undertaken in accordance with Feral Cat Trapping Work Instruction (OP-WIN-00017). All feral animal control by contractors is to be in compliance with the Euthanasia of Feral Animals Work Instruction (OP-WIN-00019).

Table 3: Key risks to fauna management and associated management actions or Controls

6.1 Management actions

The Fauna Management Procedure (OP-PRO-00134) details the actions which when implemented will minimise and manage the impacts to fauna, and reporting requirements. Separate Work Instructions provide detailed step by step instructions regarding the considerations, preparation and actions to be taken during specific tasks or circumstances. A list of relevant Work Instructions can be found in Section 0.

The information below provides some context to the key actions.

6.1.1 Trenches, excavations, pipes and open water storage

Open trenches and excavations pose a high risk to both small and large fauna. Large fauna species such as kangaroos and livestock can be injured or killed should they fall into the trench, while smaller species can fall into the trench and be trapped; this can result in them becoming easy prey for predatory species or dehydrate and die. During periods of heavy rainfall, fauna are also at risk of drowning, as trenches flood with water. Small vertebrates are also at risk of burial within the trench during backfill operations if the trench is not checked prior to backfilling.

To minimise the risk to fauna, trenches should be open for a minimum length of time and permanent egress devices, such as ramps, should be installed to allow for the unimpeded movement of fauna into/out of the trenches. Trenching associated with the installation of pipes should also be delayed until welding and joint coating of pipe works is completed, to assist with reducing the length of time trenches are open. Fauna refuges, such as branches and hessian bags, should also be provided in the trench or excavation to provide shelter from the sun and protection from predators.

Uncapped pipes provide suitable shelter and protection for animals. Therefore it is important that all pipes in laydown areas and not in the process of being installed / used have the ends capped to prevent fauna entrapment and use. It is also advised that pipes are checked for the presence of animals prior to installation.

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The installation of the Roy Hill railway creates a permanent structure which prevents or threatens the safe movement of fauna individuals across the railway line. All water management culverts installed along the railway line are 'fauna friendly' (defined as culverts with a minimum diameter of 600 mm; Eco Logical Australia 2011). Additional culverts, installed at strategic locations, have been installed primarily to assist the ongoing movement of fauna, particularly species of conservation significant, from one side of the railway to the other. A culvert monitoring program has been implemented to comply with EPBC 2010/5424 Condition 2 to evaluate the use and effectiveness of fauna friendly culverts.

6.1.2 Vegetation clearing

During clearing activities fauna, particularly small reptiles, are disturbed and forced to escape danger from earth moving equipment and clearing of vegetation and land (their protective cover). They also often put themselves in the line of fire to investigate newly disturbed/overtaken earth as a result of their inquisitive nature. Many animals will shelter from direct sun during the day and this may include the vegetation being cleared, and hence care should be taken during clearing events not to injure any fauna present.

It is suggested clearing activities progress in a slow systematic manner, so as not to confuse or trap escaping fauna. Clearing activities, where practical, shall progress to avoid creating islands of vegetation that will create refuges for fauna. Vegetation shall be cleared in the same direction where possible. As the machine works across the clearing area, any fauna are encouraged to move toward the boundary or the boundary of an already cleared area and therefore out of the line of fire.

A Fauna Spotter can walk ahead and adjacent to the machine, encouraging the movement of fauna away from the clearing of vegetation. The Fauna Spotter should be within the line of sight of the machine operator at all times, using hand signals and/or radio communications to communicate to the machine operator and to allow fauna to escape when needed.

As vegetation is stockpiled, the Fauna Spotter shall also discourage the movement of fauna onto/near the stockpiles. This avoids the fauna getting trapped or crushed by more vegetation/soil as it continues to be stockpiled.

Many animals, particularly in the hot Pilbara environment, are less active during the heat of the day and most active in the morning/evening. Therefore, these animals may take longer to move/react to disturbance and are at a higher risk of injury or death from earth works in the middle of the day.

Many reptile species reside in burrows during the winter months, as it is too cold for them to be active during this time. As such, these species may also take longer to move/react to disturbance and are at a higher risk of injury or death from earth works.

It is not expected that fauna should be captured, restrained or held during the implementation of these management actions. The clearing event is already likely to cause stress to animals, without the added stress of being captured/held. Animal welfare is the prime priority and responsibility of the persons carrying out the mitigation measures/actions.

Trees and tall structures provide for nesting areas, particularly large birds of prey. Fauna spotters should inspect all trees located within clearing footprint to check for the presence of bird nests, including eggs and chicks prior to clearing activities. Should eggs or chicks be found in the nest, the Superintendent Environment (or delegate) should be contacted for advice.

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6.1.3 Feral animals

Feral animals prey upon a wide range of mammals, birds, reptiles, amphibians and insects. They represent a significant threat to vulnerable and endangered native fauna, and may also have indirect impacts on wildlife and livestock through the transmission of diseases such as toxoplasmosis and sarcosporidiosis (Sharp 2012).

A variety of control methods can be used depending on the target species, including shooting, trapping, poison baiting, exclusion fencing, den fumigation and den destruction. The Roy Hill Project implements a feral animal program, which consists of feral cat trapping, feral dog baiting (with sodium fluoroacetate, commonly known as 1080) and padded jaw trapping of foxes, on an as needs basis.

Cage traps are the preferred method of capture for feral cats on Roy Hill as non-target animals can be released unharmed and trapped feral cats can be transported away from the area for euthanasia. Every effort must be made to avoid target and non-target species from factors such as exposure or shock, especially heat. Traps must be inspected daily to prevent suffering and possible death from exposure, dehydration, starvation and/or shock.

The use of 1080 baits (which contains sodium fluoroacetate) is the preferred method for feral dogs as it covers a large area and the impact to native fauna can be controlled and reduced (with bait size and concentration, burial placement/method and distance between laid baits). Native fauna are tolerant of the poison (sodium fluoroacetate which naturally occurs in plants of the *Gastrolobium* genus (Department of Parks and Wildlife 2014), but it is lethal, even in tiny amounts, to introduced animals. 1080 baits must only be prepared by authorised officers, and access to 1080 and poisoned baits must be restricted to approved personnel only.

Padded jaw traps are the preferred method used on foxes at Roy Hill Port project area. Foxes are generally only an issue at the Port, and the fox (and cat) control program is usually implemented in conjunction with the regional program led by the Pilbara Ports Authority, aimed at concentrating feral animal control around the turtle nesting and hatching seasons. Trapping is used at the Port to control nuisance animals that are known to hang around the area, and fewer non-target species are present that could be negatively impacted by the trapping program.

Trapped feral animals must be destroyed as quickly and humanely as possible. Roy Hill only uses a licenced, skilled operator (approved consultants, see Feral Cat Trapping Work Instruction: OP-WIN-00017-002) who has the necessary experience with firearms and who holds the appropriate licences and accreditation.

Approved (by the Roy Hill Biological Sciences team) consultants must ensure that the euthanasia of animals is humane and follow the below criteria:

- Is painless;
- Produces rapid loss of consciousness and death;
- Interrupts consciousness and reflexes simultaneously;
- Requires minimum restraint;
- Avoids excitements and causes minimal psychological stress to the animal;
- Is appropriate for the age of the animal;
- Exhibits consistent and predictable action;
- Is easily and safely administered by properly trained personnel;
- Causes minimal emotional effects to operator and observers;

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- Is not subject to abuse by humans;
- Is not a disease or an environmental problem;
- Does not result in tissue changes that would effect a post-mortem diagnosis;
- Is economical and readily available; and
- Does not leave carcasses that if consumed will result in secondary poisoning.

7 Monitoring and Research Programs

To inform future practices and adaptive management systems in relation to fauna management Roy Hill will:

- Undertaken discussions with DPaW on the regional occurrence of conservation significant fauna;
- Keep up to date with latest fauna survey and feral animal control methodologies; and
- Improve Roy Hill fauna programs in response to results and discussions with fauna specialists.

In addition to the above practices, Roy Hill has a number of monitoring or research programs currently under development or being implemented. The majority of these programs have been developed in response to project approval conditions and have to meet specific criteria. Roy Hill monitoring or research programs include:

- Northern Quoll Research Plan
- Threatened Fauna Offset Plan
- Long term monitoring of translocated fauna
- Evaluation of linear infrastructure, including effectiveness of culverts
- Tracking of fauna relocated from trenches
- Monitoring of SRE habitat
- Feral Animal Control
- Evaluation of the presence of aquatic biota

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8 Definitions

Term	Definition
Conservation Significant Fauna	Fauna listed as species of national environmental significance, Scheduled Fauna or DEC Priority species.
Fauna	All animals; including native, non-native and feral animals
Fauna egress device	Ramp, webbing or other such structures that allow animals to escape from excavations or bodies of water
Fauna friendly culvert	Culvert designed to minimise impact on significant fauna (minimum diameter of 600 mm)
Feral animals	Pests declared under the <i>Biosecurity and Agriculture Management Act 2007</i>
Fauna spotter	Personnel who accompany clearing activities to spot ground ahead of machine conducting clearing activities to ensure fauna are not harmed.
Priority species	Species listed on DEC Priority List (on lists held by DPaW, previously DEC).
Roy Hill Environment Team	The Roy Hill Environment Team, incorporating Perth and Site based staff
Scheduled Fauna	Species published under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (under the <i>Wildlife Conservation Act 1950</i>).
Specialist Biological Sciences	The Specialist Biological Sciences of the Roy Hill Environment Team
Stygofauna	Any fauna that live in groundwater systems or aquifers, such as some caves, fissures and vugs. One of two types of subterranean fauna.
Superintendent Environment	The Superintendent of The Roy Hill Environment Team (Port and/or Mine)
Taxa	Groups of one or more populations of an organism or organisms
Threatened species	Species listed under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> or the <i>Wildlife Conservation Act 1950</i>
Troglofauna	Small cave-dwelling animals that have adapted to their dark surroundings and breathe atmospheric oxygen. One of two types of subterranean fauna.

Table 3: Definitions

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9 Abbreviations

Abbreviation	Definition
AW Act	<i>Animal Welfare Act 2002</i>
CAMBA	China-Australia Migratory Bird Agreement
DEC	Department of Environment and Conservation (now DPaW)
DPaW	Department of Parks and Wildlife (State Environmental Department)
DRF	Declared Rare Flora
EP Act	<i>Environment Protection Act 1986</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FMP	Fauna Management Plan
FMG	Fortescue Metals Group
IBRA	Interim Biogeographic Regionalisation for Australia
JAMBA	Japan-Australia Migratory Bird Agreement
MNES	Matters of National Environmental Significance
MS	Ministerial Statement
mtpa	million tonnes per annum
NQRP	Northern Quoll Research Plan
PHPA	Former Port Hedland Port Authority, now Pilbara Ports Authority
PPA	Pilbara Ports Authority
RHIO	Roy Hill Iron Ore
SRE	Short range endemic
TFOP	Threatened Fauna Offset Plan
VFMP	Vertebrate Fauna Management Plan
WC Act	<i>Wildlife Conservation Act 1950</i>

Table 4: Short titles and acronyms

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10 References

Table 6 below lists the documents related or referred to in the FMP. Section 10.1 below lists the references of all other documents used for background or reference material.

Document number/ Reference	Title
OP-PLN-00044	Rehabilitation Management Plan
100RH-0000-HS-PLN-2025	Ginbata Aerodrome Wildlife Hazard Management Plan
100RH-3000-EN-REP-2009	Vertebrate Fauna Management Plan for Roy Hill Railway Corridor (VFMP)
OP-PRO-00193	Ground Disturbance Permit Procedure
OP-PRO-00134	Fauna Management Procedure
OP-PRO-00101	Rehabilitation Management Procedure
OP-PRO-00150	Borrow Pit and Quarry Management Procedure
OP-PRO-00062	Using a Firearm Procedure
TBD	Fauna Handling Work Instruction
OP-WIN-00114	Snake Handling Work Instruction
OP-WIN-00013	Feral Dog Baiting Work Instruction
OP-WIN-00017	Feral Cat Trapping Work Instruction
OP-WIN-00019	Euthanasia of Feral Animals Work Instruction (for Specialist Contractor reference)
TBD	Euthanasia of Fauna Work Instruction (for Roy Hill Environment Team reference)
100RH-0000-EN-GUI-2004	Significant Flora, Fauna and Weed Species Identification Guide
OP-GUI-00002	Animal Track Identification Guideline
TBD	Marine Fauna Identification Guide

Table 5: Roy Hill Related Documents

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Fauna Management Plan

Health, Safety and Environment

WorleyParsons (2012). Vertebrate Fauna Risk Assessment: Proposed laydown Port Hedland

11 Review

This Plan is to be reviewed as follows:

- Annually; or
- As a result of findings or actions identified through inspections, audits and incident reporting.

Reviews are to examine the appropriateness of this plan, taking into consideration corporate, system and compliance requirements and legislative changes since the last review was undertaken.

Also, as more research and industry knowledge is gained, the management and procedures associated with this document shall be updated to reflect the current best practices applicable to the region and specific area.

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