

Supporting Information

EPBC Act Referral Supporting Information

North Star Hematite Project

30 July 2012



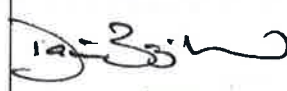

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Fortescue
The New Force in Iron Ore

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TABLE OF CONTENTS

1.	INTRODUCTION	5
2.	MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE.....	5
2.1	Listed Threatened Species and Ecological Communities	6
2.1.1	Threatened Fauna.....	6
2.1.2	Habitat of Conservation Significance	10
2.2	Migratory Species Protected Under International Agreements.....	10
3.	IMPACTS ASSESSMENT - MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	11
3.1	Potential Impacts	11
3.1.1	Loss of Habitat of Conservation Significance.....	11
3.1.2	Impacts to the Northern Quoll (<i>Dasyurus hallucatus</i>).....	12
3.1.3	Impacts to the Pilbara Leaf-nosed Bat (<i>Rhynonictoris aurantia</i> (Pilbara form)).....	13
3.1.4	Impacts to the Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	13
3.2	Proposed Management Measures	14
3.3	Predicted Environmental Outcome	16
3.3.1	Northern Quoll	16
3.3.2	Pilbara Leaf-nosed Bat.....	18
3.3.3	Pilbara Olive Python.....	21

List of Tables

Table 1:	EPBC Listed Threatened Species Search Results	6
Table 2:	EPBC Listed Migratory Species	11
Table 3:	Assessment of Impacts to the Northern Quoll against the Significant Impact Criteria (DEWHA, 2009).....	17
Table 4:	Assessment of Impacts to the Pilbara Leaf-nosed Bat against the Significant Impact Criteria (DEWHA, 2009)	20
Table 5:	Assessment of Impacts to the Pilbara Olive Python against the Significant Impact Criteria (DEWHA, 2009)	23

LIST OF FIGURES

Figure 1:	Project Location
Figure 2:	Conceptual Project Layout
Figure 3:	Mine Access and Haul Road
Figure 4:	Northern Quoll Habitat and Records
Figure 5:	Northern Quoll Records – Mining Area
Figure 6:	Pilbara Leaf-nosed Bat Habitat and Records
Figure 7:	Pilbara Olive Python Habitat and Records
Figure 8:	Fauna Habitats and Conservation Significant Fauna Records
Figure 9:	Hydrology of the Project Area and Surrounds
Figure 10:	Aboriginal Heritage Sites

LIST OF APPENDICES

Appendix 1:	Fauna Surveys
Appendix 2:	Environmental Policy

1. INTRODUCTION

FMG Iron Bridge Limited proposes to develop the North Star Hematite Project (the Project), located approximately 110 kilometres (km) south of Port Hedland in the Pilbara region of Western Australia (

Figure 1). FMG Iron Bridge is a subsidiary company of Fortescue Metals Group Limited (Fortescue).

It is proposed to extract a maximum of 11.3 million tonnes of mag-hematite at an annual rate of up to 5.0 Mtpa for approximately two and a half years. Ore will undergo crushing, screening and some magnetic separation. The conceptual Project layout is shown on Figure 2 and Figure 3.

This document has been prepared as supporting information for formal referral of the Project to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act provides for the protection of nationally and internationally significant flora, fauna, ecological communities and heritage places. Under the EPBC Act, the following Matters of National Environmental Significance (MNES) are:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mines).

Of these, the following are relevant to the Project and addressed in detail in this section:

- Listed threatened species
- Migratory species protected under international agreements.

2.1 Listed Threatened Species and Ecological Communities

2.1.1 Threatened Fauna

Threatened terrestrial fauna may be listed under the EPBC Act as Critically Endangered, Endangered, Vulnerable, Conservation Dependant or Migratory.

A search of the Project area using the EPBC Act Protected Matters Search Tool identified five threatened fauna species which may occur in the area. Four of these have a medium to high likelihood of occurrence (Table 1).

Table 1: EPBC Listed Threatened Species Search Results

Species	Common Name	EPBC Status	Likelihood of Occurrence
<i>Dasyercus cristicauda</i>	Mulgara	Vulnerable	Low – Little suitable habitat exists within the Project area
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	High – Recorded during surveys
<i>Macrotis lagotis</i>	Greater Bilby	Vulnerable	Medium – Not recorded during surveys but habitat exists along the western portion of the access road
<i>Rhinonicteris aurantia</i> (Pilbara form)	Pilbara Leaf-nosed Bat	Vulnerable	High – Recorded during surveys
<i>Liasis olivaceus barroni</i>	Olive Python (Pilbara subspecies)	Vulnerable	High – Recorded during surveys

The following fauna surveys were undertaken:

- A Level 2 fauna survey was undertaken by *ecologia* Environment in March/April and October/November 2011.
- Targeted fauna survey for Northern Quoll, Pilbara Leaf-nosed Bat and Pilbara Olive Python was undertaken by *ecologia* Environment in July 2011.

These surveys were undertaken in accordance with EPA Guidance Statement 56 (EPA, 2004b), Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DEC, 2010), referral guideline for the Northern Quoll (DSEWPaC, 2011a), and survey guidelines for Australia's threatened reptiles, mammals and bats (DSEWPaC 2011b; 2011c; 2010) as appropriate. The survey extent covered the proposed mine and processing infrastructure areas, accommodation camp, mine access and haul road as far as the FMG Mainline railway, and surrounding area. The survey reports are provided in Appendix 1.

Mulgara

The Mulgara has recently been reclassified and separated into two genetically and morphologically distinct species, the Brush-tailed Mulgara (*Dasyercus blythi*) and Crest-tailed Mulgara (*Dasyercus cristicauda*). Since previous records did not distinguish between the two

species there is some ambiguity over their exact distributions, however recent research indicates that *D. cristicauda* prefers sand ridges while *D. blythii* prefers sand plains and gibber plains (ecologia Environment, 2012). Using this habitat preference as a basis, it is considered unlikely that *D. cristicauda* will occur within the Project area or surrounds due to a lack of sand dunes and sand ridges. *D. blythii* has a medium likelihood of occurring in the local area, however, no individuals were recorded during the 2011 surveys by ecologia Environment. Of the two species only *D. cristicauda* is listed as a Threatened species under the EPBC Act.

Greater Bilby

The Greater Bilby is a rabbit sized bandicoot with large ears, long, soft, blue-grey fur over most of the body, and white to cream fur on the belly. The Greater Bilby was formerly found over 70% of mainland Australia but is now restricted to less than 20 percent of this. In the Pilbara bioregion the majority of recodes are from the Chichester sub-region (DEC, 2012).

No Greater Bilby individuals or other signs were recorded during the 2011 survey by ecologia Environment. Suitable Greater Bilby habitat (Sandy Plains with Spinifex and Scattered Granites) has been mapped in the western part of the Project area and surrounds (ecologia Environment, 2012) along a portion of the Mine Access and Haul Road. The final alignment of the haul road can be adjusted should any Greater Bilby burrows be observed.

Sand plain habitat is widespread in both the local area and the Pilbara region. The required clearing of up to 43 hectares (ha) of this habitat will not significantly alter its extent in the region. Any Greater Bilbies which may be present are likely to disperse into surrounding areas of suitable habitat away from the Project area (ecologia Environment, 2012). It is therefore considered unlikely that construction and use of the Mine Access and Haul Road will significantly impact on the Greater Bilby population or survival of this species. As a result the potential for significant impact is very low and this species is not discussed further.

Northern Quoll

The Northern Quoll is the smallest of the four quoll species found in Australia. In the Pilbara Bioregion records are scattered across the four sub-regions (Hamersley, Fortescue Plains, Chichester and Roebourne Plains) though the majority of recent records have come from the Rocklea, Macroy and Robe land systems (DSEWPaC, 2012a), particularly in the Chichester sub-region (ecologia Environment, 2011). The Project area is close to the centre of the species' distribution in the Pilbara (ecologia Environment, 2011).

Northern Quolls are short lived with males generally living for a year and the oldest female recorded from the wild being three years of age (Threatened Species Scientific Committee, 2005). While males and females have similar sized home ranges outside of the breeding season, home ranges of the males expand significantly during the breeding season and can overlap several other ranges, both male and female. Oakwood (2002) suggests that female home ranges are in the order of 35 ha while male home ranges and be greater than 100 ha during the breeding season.

The Northern Quoll occupies a diversity of habitats, but habitat generally encompasses some rocky area for denning with surrounding vegetated habitats used for foraging and dispersal (Threatened Species Scientific Committee, 2005). The targeted survey undertaken by *ecologia* Environment (2011) mapped a total of 900.7 ha of suitable and potential habitat in the area surrounding the Project. Of this, approximately 295 ha was classified as critical denning habitat, comprising mainly of rocky slopes, ridges and gorges. An additional 108 ha was classified as potential denning/foraging habitat. Northern Quoll denning and foraging habitat is shown on Figure 4.

A total of 20 individual Northern Quolls were captured during the targeted survey. Four of these were female, indicating a permanent breeding population (*ecologia* Environment, 2011). Two female quolls were captured approximately 9.5 km north east of the Project while a third female was captured approximately 3.5 km to the south. All three of these females were captured outside of the Project tenements. The fourth female was captured close to the northern extent of the North Star plateau, approximately 1.1 km west of the proposed processing area. This individual was captured on three separate occasions with all captures within 250 m of each other and within a discrete area of mapped habitat, 22 ha in extent. As the home range of female quolls is generally regarded to be about 35 ha (Oakwood 2002), it is considered likely that this female will remain within the area of mapped habitat in which it was captured and is unlikely to move into habitat mapped further south along the ridgeline.

Captures of male quolls were distributed across the majority of trapping sites. The location of all Northern Quoll captures in proximity to the mining and processing areas is shown on Figure 5 and includes records where the same individual was re-captured multiple times. Areas where female quolls have been captured are considered to be of higher value to the local population as these areas represent critical breeding habitat.

Suitable habitat for Northern Quoll is expected to be well represented in the wider region. The majority of records were from the Capricorn land system, which extends north east and south east of the Project area. Additionally, the Project area is located on the north western edge of a series of ranges which extend at least 70 km to the east and 45 km south of the Project area. These ranges are expected to provide additional suitable denning, foraging and dispersal habitat for the Northern Quoll. Outback Ecology (2011) undertook a review of surveys conducted within 150 km of Atlas Iron's Abydos DSO project, which is located approximately 14.5 km north east of the Project area. This review found that, of the 14 surveys undertaken, 11 recorded the presence of Northern Quoll, mostly in rocky ridges, gorges, granite outcrops and watercourses (Outback Ecology, 2011). Outback Ecology (2011) recorded a total of 11 Northern Quolls from the 172 ha Abydos study area, including three females. This suggests that Northern Quolls are well represented in the local region and are likely to be found in areas of habitat similar to that found surrounding the Project area.

Pilbara Leaf-nosed Bat

The Pilbara Leaf-nosed Bat is a medium sized bat with short, orange fur and fleshy noseleaf structure surrounding the nostrils. The species roosts in caves and disused mines with stable,

warm and humid microclimates (DSEWPac, 2012b). They are unlikely to roost in shallow caves due to the lack of humidity in these caves (ecologia Environment, 2011). Foraging habitat is varied and has been observed in *Triodia* hummock grasslands, along creek lines with *Eucalyptus camaldulensis*, amongst granite boulders and over pools and low shrubs in ironstone gorges (DSEWPac, 2012b).

The targeted survey undertaken by *ecologia* Environment (2011) mapped approximately 713 ha of terrain which may contain caves suitable as potential roost habitat for the Pilbara Leaf-nosed bat. Of this, 418.6 ha is classed as potential wet season roost habitat and is located along the Turner River to the west of the project area. The remaining 294.4 ha is potential dry season roost habitat and is generally found along cliffs associated with ridgelines and in gorges. Potential dry and wet season roost habitat is shown on Figure 6.

Pilbara Leaf-nosed Bats were recorded from 14 locations during the 2011 survey. Four of these were considered to represent potential roost caves with three considered to be potential dry season roost caves. Three of the four potential roost caves are at least 500 metres (m) from the proposed mining and processing activities. The remaining cave is about 125 m from the southern edge of the proposed open pit. Construction/mining activity within 50 m of roost caves may result in disturbance of the bats and abandonment of the roost. The locations of these caves and other records are provided on Figure 6. The survey results suggest that western cliff edges may provide roost habitat for this species (ecologia Environment, 2011).

The Project area is part of an extensive series of ranges and the landforms of the Project area are therefore not considered unique in the region. While these ranges have not been extensively surveyed, it is expected that suitable roost habitat will occur across the area in similar land systems and landforms as found at the Project area. Surveys undertaken as part of the Pilbara Biological Survey indicate that the Pilbara Leaf-nosed Bat is more common than previously thought (McKenzie & Bullen, 2009). A large colony of 50 to 100 Pilbara Leaf-nosed Bats has been recorded at the Lalla Rookh Mine approximately 10 km to the north east (DSEWPac, 2012b).

Pilbara Olive Python

The Pilbara Olive Python is a subspecies of the Olive Python and occurs in the ranges of the Pilbara region (DSEWPac, 2012c). The species is considered to be stable with sizable populations at some known sites (Pearson, 1993).

The Pilbara Olive Python inhabits watercourses and areas of permanent water in rocky gorges or gullies (Pearson, 1993). Individuals have also been seen feeding at the entrance to bat roost caves. The species has generally been recorded from the McKay, Rocklea and Newman land systems, however the 2011 Level 2 survey by *ecologia* Environment recorded a number of pythons in the Capricorn land system.

A total of approximately 1,045 ha of potentially suitable Pilbara Olive Python habitat was mapped during the 2011 targeted survey by *ecologia* Environment. Of this, the majority

(418.6 ha, 40 percent) is associated with the Turner River. The habitat along the Turner River is considered critical habitat by *ecologia* Environment (2011). Small areas of critical habitat also occur in association with water pools in rocky gorges. Some critical habitat has been identified along the edge of the rocky ridge west of the proposed open pit and associated with a creekline to the east of the mine infrastructure area. The remaining 613 ha has been classified as Potential habitat or Inaccessible. Pilbara Olive Python habitat is shown on Figure 7.

A total of six Pilbara Olive Pythons have been recorded during the 2011 surveys. An additional three observations of secondary evidence (skin, scats or remains) were recorded during the targeted survey. All sightings of live pythons were at locations where surface water was present. One individual was recorded at Fig Pool, Cow Spring and near Dirty Water Pool while three individuals were recorded at Site 12 Pool. All locations are outside of areas proposed to be cleared for the Project (Figure 7).

2.1.2 Habitat of Conservation Significance

The Rocky Ridges/Breakaways/Gorges fauna habitat has been identified as being of conservation significance as it is critical habitat for the Northern Quoll and the Pilbara Leaf-nosed Bat. Where this habitat coincides with permanent or long term pools it is also considered critical habitat for the Pilbara Olive Python (*ecologia* Environment, 2012).

The Rocky Ridges, Breakaways and Rocky Gorges provides denning habitat for the Northern Quoll, roost caves for the Pilbara Leaf-nosed Bat and rock faces and permanent water pools for the Pilbara Olive Python to forage, shed their skin and mate. The habitat occurs along the edges of ridgelines, in particular occurring in association with the Gorge Range within which the proposed mine area is located. Studies undertaken by *ecologia* Environment (2012) have mapped 591.8 ha of this habitat in the vicinity of the Project area. Four potential roost caves of the Pilbara Leaf-nosed Bat have been identified in this habitat during the 2011 surveys by *ecologia* Environment.

Fauna habitats mapped by *ecologia* Environment (2012) are shown on Figure 8.

2.2 Migratory Species Protected Under International Agreements

A total of eight migratory species have been identified from searches of the EPBC Act Protected Matters Search Tool for the Project area. Of these, three species have a medium to high likelihood of occurring within the Project area and surrounds. Listed migratory species that may occur within the Project area and surrounds are shown in Table 2 and on Figure 8.

Table 2: EPBC Listed Migratory Species

Species	Common Name	Status	Likelihood of Occurrence
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory Marine	High - recorded during 2011 surveys
<i>Ardea alba/modesta</i>	Great Egret, White Egret	Migratory Marine / Migratory Wetland	Low – area does not provide preferred habitat for this species
<i>Ardea ibis</i>	Cattle Egret	Migratory Marine / Migratory Wetland	Low – area does not provide preferred habitat for this species
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory Terrestrial	Low – not recorded during fauna surveys.
<i>Hirundo rustica</i>	Barn swallow	Migratory Terrestrial	Low – normally recorded from coastal lowlands, near towns and cities
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory Terrestrial	High - recorded during 2011 surveys
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	Migratory Wetland	Medium – recorded from the region
<i>Glareola maldivarum</i>	Oriental Pratincole	Migratory Wetland	Low – no records in the region

3. IMPACTS ASSESSMENT - MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.1 Potential Impacts

The aspect of primary relevance to potential impacts on MNES in the mine area is the clearing and earthworks associated with the construction of the Project.

Migratory species recorded from the Project area or surrounds are considered to be widespread, highly mobile and commonly recorded within the Pilbara region and are therefore unlikely to be significantly impacted by the Project.

Potential impacts to MNES species and habitats as a result of the development of the Project are discussed below.

3.1.1 Loss of Habitat of Conservation Significance

No clearing is required within the Breakaways and Rocky Gorges habitat. FMG Iron Bridge has optimised the placement of infrastructure to avoid direct impact to this habitat. However, this habitat may be subject to indirect impacts from elevated levels of dust deposition, particularly immediately to the west of the proposed processing area.

The Rocky Ridges, Breakaways and Rocky Gorges habitat provides denning habitat for the Northern Quoll, roost caves for the Pilbara Leaf-nosed Bat and rock faces and permanent water pools for the Pilbara Olive Python to forage, shed their skin and mate. This habitat occurs along

the edges of ridgelines, in particular occurring in association with the Gorge Range within which the mine area is located. A total of 592 ha of this habitat has been mapped by *ecologia* Environment during the 2011 surveys. The Rocky Ridges, Breakaways and Rocky Gorges habitat is likely to be well represented in the wider region with ranges extending at least 70 km to the east and 45 km to the south of the mine area.

Four potential roost caves have been identified during the 2011 surveys by *ecologia* Environment. The nearest of these caves is about 125 m from the southern edge of the proposed open pit.

3.1.2 Impacts to the Northern Quoll (*Dasyurus hallucatus*)

Project infrastructure has been located to avoid or minimise impacts to the Northern Quoll. This includes positioning of the proposed open pit 50 m from the edge of the plateau in order to avoid clearing of the Rocky Ridges, Breakaways and Rocky Gorges habitat. About 249 ha (42 percent) of this habitat unit has been identified as suitable denning and breeding habitat for the Northern Quoll. A further 606 ha has been identified as foraging and dispersal habitat. This includes the remainder of the Rocky Ridges, Breakaways and Rocky Gorges as well as the Granite Outcrop habitat and Creek line habitat along the Turner River. No clearing will occur in the Granite Outcrops habitat while only minimal clearing (about three hectares) will be required at the Turner River in order to construct a crossing for the proposed Mine Access and Haul Road. This equates to about 0.4 percent of the mapped extent of potential foraging, breeding or dispersal habitat for the Northern Quoll.

Northern Quoll habitat immediately to the west of the proposed open pit may be indirectly impacted through elevated levels of dust deposition during the life of the Project. However, as there were no female quolls recorded, it is likely that this area does not provide suitable breeding habitat and instead is used for foraging and dispersal, with male Northern Quolls moving through the area in order to access habitat and home ranges of female quolls to the north and south.

The area of habitat along the northern end of the North Star plateau (north west of the proposed processing infrastructure) is likely to constitute the home range of the female captured in this area and is therefore considered to be of greater importance to the breeding population than the habitat immediately west of the proposed open pit. Being further away from dust emission sources, this area has a low risk of indirect impacts from elevated levels of dust deposition.

Suitable habitat for the Northern Quoll exists within 2 km north and south of the proposed Mine Access and Haul Road, mostly along the Turner River. This has potential to increase the risk of Northern Quolls being struck by vehicles on the access road as they are likely to move between these two habitat areas. Proposed measures to minimise this risk are presented in Section 3.2.

3.1.3 Impacts to the Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia* (Pilbara form))

Four potential roost caves for the Pilbara Leaf-nosed Bat have been identified during the 2011 surveys of the Project Area and surrounds. Three of these were identified as potential dry season roost caves and one as a potential wet season roost cave. This species is known to be sensitive to disturbances within or in close proximity to roost caves and are known to abandon caves where construction or mining activities occur within 50 m of the roost. Disturbances which occur at least 85 m from the roost however, may not result in abandonment (Armstrong, 2010). The Mt Dove DSO Project was given conditional approval by the Federal Minister for the Environment which allowed for development to occur up to 20 m from potential roost caves.

Displaced bats are susceptible to death through dehydration, particularly during the dry season. The nearest potential roost cave to the proposed Project infrastructure is about 125 m south of the edge of the open pit (Figure 6) and about 200 m from the hot tyre park up area and access road. Noise and vibration impacts to this roost cave are likely to be minimal. The remaining caves are at least 500 m from any disturbance.

While blasting in proximity to roost caves may cause Pilbara Leaf-nosed Bats to abandon roosts (DSEWPac, 2012b) this has been shown to have no impact on foraging of Pilbara Leaf-nosed Bats in nearby habitat (BHP Billiton Iron Ore, 2005).

Studies at roosts have demonstrated that artificially increased light levels can significantly delay the timing of bat emergence (Downs *et al* 2003; Duverge, 2000) and disturb their use of commuting routes (Stone *et al* 2009), both of which will reduce the time available for foraging. However, all identified potential roost caves are at least 1.5 km from permanent light sources associated with the proposed processing area, administration area and accommodation camp. Lighting within the proposed open pit will move based on the mining schedule and lights can be positioned such that they are directed away from potential roost caves, thereby reducing light spill in the direction of these caves. Additionally, the nearest potential roost cave to the proposed open pit faces to the west, which reduces the potential for light to spill directly into the cave. A series of ridges occur between the identified potential roost caves and other light sources (such as the accommodation camp and administration area) which will reduce the amount of light that may be visible from these caves. As with lighting for the proposed open pit, lighting required for other areas of the operation can be directed to minimise light spill towards potential roost caves.

Pilbara Leaf-nosed bats are known to forage close to the ground and may therefore be susceptible to vehicle strikes.

3.1.4 Impacts to the Pilbara Olive Python (*Liasis olivaceus barroni*)

Critical habitat for this species is considered to consist of semi-permanent water pools in rocky gorges and watercourses. A total of 432 ha of this habitat has been mapped by *ecologia*

Environment (2012a), the majority of which is Creek line habitat found along the Turner River. A small amount of clearing (about three hectares) will be required in order to construct the road crossing at the Turner River. Additional suitable habitat for this species consists of portions of the Creek line, Granite Outcrops, and Rocky Ridges, Breakaways and Gorges habitats. A total of 532 ha of suitable habitat has been mapped by *ecologia* Environment (2012a).

A total of 11 water pools have been recorded in the vicinity of the Project area (Figure 9). With the exception of Central Creek Pool, the remaining pools are likely to provide habitat for the Pilbara Olive Python. No direct impacts to these pools are expected as a result of the Project. The proposed Waste Rock Dump will fill part of the upper catchment of Site 12 Pool and thereby potentially result in indirect impacts to the pool through decreased flows and water quality, particularly sediment load. However, the area of the catchment to be impacted makes up a small portion (less than five percent) of the pool's entire catchment and impacts are therefore expected to be minor (WorleyParsons, 2012). Additionally, the observed movement of water through the pool and type of vegetation present indicates the pool is groundwater fed (*ecologia* Environment, 2012) and therefore less likely to be reliant on inflows from the catchment.

Pilbara Olive Pythons have also been known to benefit from additional water sources associated with mining, such as water storage ponds (Hill & Ward, 2010).

Pilbara Olive Pythons may be particularly vulnerable to vehicle strikes as roads are often preferred basking spots for snakes. Suitable habitat for the Pilbara Olive Python occurs within 2 km on either side of the access road, particularly in association with the Turner River.

Noise and vibration emissions resulting from blasting in the proposed open pit may cause Pilbara Olive Pythons to relocate to areas of suitable habitat further from noise and vibration sources. However, this effect is expected to be temporary with pythons moving back into areas previously occupied once mining and processing operations cease.

3.2 Proposed Management Measures

Project infrastructure has been designed and located so as to avoid or minimise impacts to fauna species protected under the EPBC Act and conservation significant habitats for these species. Management measures proposed to avoid or minimise impact from the implementation of the Project on MNES include:

- The open pit has been set back from the edge of the plateau in order to avoid clearing of critical Northern Quoll denning and breeding habitat.
- The mine pit has been planned to maximise the separation distance between blasting operations and potential roost caves for the Pilbara Leaf-nosed Bat and thereby minimise impacts.
- Likewise, other Project infrastructure (in particular, processing infrastructure) has been located to minimise noise impacts on potential roost caves.

- Progressive rehabilitation will be undertaken when cleared areas are no longer required.
- Internal (Fortescue) Ground Disturbance Permits (GDP's) will be implemented for all clearing activities prior to commencement of works.
- Clearing for the road crossing of the Turner River will be kept to the minimum required to provide a safe working environment.
- "Confined" blasting techniques will be used in preference to unconfined methods.
- Known locations of Northern Quoll, Pilbara Leaf-nosed Bat and Pilbara Olive Python will be mapped and access to these areas restricted as far as practicable.
- Access to water pools will be restricted to authorised personnel only.
- Access to potential roost caves for the Pilbara Leaf-nosed Bat will be restricted to authorised personnel only. Entry into confirmed roost caves will be prohibited.
- An appropriate buffer will be established and maintained around identified potential roost caves for the Pilbara Leaf-nosed Bat.
- A monitoring program for Pilbara Leaf-nosed Bats will be undertaken in order to confirm the continued presence of the species in the area during the life of the Project.
- Monitoring will be undertaken in accordance with the Mine and Rail Dust Management Plan in relation to dust impacts on vegetation of the Rocky Ridges, Breakaways and Rocky Gorges habitat.
- Water trucks will be used for dust suppression on haul roads, access tracks, the pit floor and high traffic areas.
- Dust suppression (such as sprinklers) will be installed as part of ore processing facilities and on ore stockpiles.
- The use of surfactants to increase dust suppression capability of applied water will be investigated.
- Lighting will be kept to that required for the safe construction and operation of the Project and the welfare of personnel.
- Lighting required at the southern end of the open pit will be located such that it does not result in increased light levels at the nearest potential roost cave.
- Vehicle speed limits will be enforced for all Project roads and tracks. Off road driving will be prohibited unless authorised or in emergency situations.
- Driving at dawn, dusk or night will be minimised as far as practicable.
- All machinery, vehicles and plant arriving on site will required to be free of vegetative matter and soil/mud.

- Information on MNES relevant to the Project and employee/contractor/visitor responsibilities will be included as part of the site induction program.
- Injured fauna will be reported to the site environmental officer who will determine the appropriate course of action.
- Any deaths of fauna species protected under the EPBC Act will be reported to DEC and DSEWPaC.
- No pets will be allowed on site, including at the accommodation camp.

3.3 Predicted Environmental Outcome

The Northern Quoll is listed as endangered under the EPBC Act while the Pilbara Leaf-nosed Bat and Pilbara Olive Python are listed as vulnerable. The MNES Significant Impact Guidelines 1.1 outline criteria for assessing whether an action “will have, or is likely to have, a significant impact on a matter of national environmental significance” (DEWHA, 2009) and have formed the basis for assessment of impact against the above listed species.

The layout of the Project has been designed and optimised in order to avoid and minimise impacts to MNES, and in particular impacts to the Northern Quoll, Pilbara Leaf-nosed Bat and Pilbara Olive Python. The Project has been designed to avoid clearing of the Rocky Ridges, Breakaways and Gorges habitat while clearing for the Mine Access and Haul Road at the Turner River will be minimised as far as practicable.

3.3.1 Northern Quoll

Assessing the Project against Table 2 of the Referral Guidelines for the Endangered Northern Quoll, *Dasyurus hallucatus* (DSEWPaC, 2011a), the Project does not represent a high risk of a significant impact to this species as no critical denning habitat (known or potential) is proposed to be directly impacted. Considering the short-term nature and localised extent of operations, significant impacts on this species resulting from dust emissions are not anticipated. Monitoring of this habitat in accordance with the Mine and Rail Dust Management Plan will enable any changes to be identified and adaptive management measures to be put in place.

A small area of potentially suitable foraging habitat for the Northern Quoll will be cleared during implementation of the Project, however, this habitat is widespread in the region and the required clearing is not expected to significantly reduce the amount of available habitat in the local area.

The Project will also result in increased traffic volumes, which may in turn increase the potential for individual quolls to be injured or killed through collisions with vehicles on roads. With implementation of the proposed management measures, the potential for significant impact is low and it is unlikely that this will impact on the size of the local population.

Implementation of the Project is unlikely to result in a significant impact to the Northern Quoll. Implementation of the proposed management measures will further reduce the risk of impact to

this species to as low as reasonably practicable. Table 3 provides a summary of the assessment of the Project against the Significant Impact Guidelines 1.1 (DEWHA, 2009).

Table 3: Assessment of Impacts to the Northern Quoll against the Significant Impact Criteria (DEWHA, 2009)

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of a population.	No. The Project has a short duration (up to two and a half years). Project infrastructure has been planned and optimised to avoid clearing critical habitat. Female quolls have been recorded at least 1 km from proposed disturbances and therefore breeding is not expected to be disrupted. Individual quolls may be injured or killed due to increased traffic, however the proposed management measures will reduce this risk to as low as reasonably practicable such that traffic impacts are not expected to impact on the size of the local population.
Reduce the area of occupancy of the species.	Possible, localised in extent. Significant effect at species/population level unlikely. The physical presence of the Project has the potential to result in avoidance of the area immediately west of the proposed open pit. However, given the Project has a short duration (up to two and a half years) this impact will be temporary. Suitable habitat is widespread in the region and individuals will be able to disperse to areas of habitat in the surrounding area.
Fragment an existing population into two or more populations.	No. Northern Quolls will be able to take alternative routes around Project disturbances. Cleared areas will be progressively rehabilitated.
Adversely affect habitat critical to the survival of a species.	Possible, but significant effect at species/population level unlikely. Elevated dust impacts may indirectly impact habitat immediately west of the pit. Given the Project has a short duration (up to two and a half years) this impact will be temporary.
Disrupt the breeding cycle of a population.	No. All recorded females are at least 1 km from high traffic areas and therefore unlikely to be adversely affected by the Project.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	No. Project infrastructure has been planned and optimised to avoid clearing critical habitat. Indirect impacts are expected to be temporary and short-term.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	No. The management measures proposed will reduce the risk of introductions of invasive species to as low as reasonably practicable.
Introduce disease that may cause the species to decline.	No. No domestic animals will be allowed on site therefore minimising the risk of introducing disease to the area.

Significant Impact Criteria	Assessment
Interfere with the recovery of the species.	No. As there is expected to be no loss of critical habitat for this species and breeding is not expected to be disrupted, the Project is unlikely to interfere with the recovery of the species.

3.3.2 Pilbara Leaf-nosed Bat

A potential dry season roost cave for the Pilbara Leaf-nosed Bat is located approximately 125 m from the edge of the proposed open pit. While noise impacts are expected to be minimal, this potential roost cave may be impacted by noise and vibration associated with blasting of the open pit, which may in turn result in abandonment of the potential roost by the Pilbara Leaf-nosed Bat. An appropriate buffer will be established to minimise the risk of damage to the cave during the life of the Project. As such, should the cave be abandoned by the Pilbara Leaf-nosed Bat, it will be available for re-colonisation following cessation of mining.

The remainder of the potential roost caves identified by *ecologia* Environment are at least 500 m from any Project disturbance area. It is expected that displaced bats will find roosts in these other caves, further from project disturbances. It is therefore considered unlikely that impacts to a single potential roost cave will result in a decline in the local population or adversely affect the survival of the species as a whole.

Habitat along the Turner River has been identified as potential wet season roost habitat. A small amount (0.4 percent of the mapped habitat extent) is proposed to be cleared for the proposed Mine Access and Haul Road. As potential wet season roost habitat is expected to be widespread in the region, particularly along watercourses such as the Turner River, the required clearing is unlikely to adversely affect the Pilbara Leaf-nosed Bat.

Implementation of the Project is unlikely to result in significant impacts to the Pilbara Leaf-nosed Bat.

Table 4 provides a summary of the assessment of the Project against the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DEWHA, 2009). Implementation of the proposed management measures will assist in reducing the risk of impacts to this species to as low as reasonably practicable.



Table 4: Assessment of Impacts to the Pilbara Leaf-nosed Bat against the Significant Impact Criteria (DEWHA, 2009)

Significant Impact Criteria	Pilbara Leaf-nosed Bat
Lead to a long-term decrease in the size of an important population of a species	No. No potential roost caves are proposed to be removed through implementation of the Project and therefore there is not expected to be a long term decrease in the local population. Additionally, the Project has a short duration (up to two and a half years) and any potential impacts will be temporary.
Reduce the area of occupancy of an important population	Possible, localised in extent. Noise impacts on the potential roost cave closest to the Project may result in abandonment of the cave for the duration of the Project. As this cave will not be destroyed it will be available to re-colonisation at the completion of mining activities. It is considered highly likely that any potentially displaced bats will find roosts in caves further from Project disturbances.
Fragment an existing important population into two or more populations	No. All recorded potential roost caves are south of the proposed disturbance areas, therefore fragmentation effects are unlikely.
Adversely affect habitat critical to the survival of a species	No. No clearing of critical (potential dry season roost) habitat is proposed.
Disrupt the breeding cycle of an important population	No. It is not known if the potential roost caves recorded are also potential maternity caves. Implementation of the Project will not remove potential roost caves, consequently the risk to disrupting the breeding cycle is predicted to be low.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. No clearing of critical habitat is proposed. Foraging habitat is extensive in the region. Clearing associated with the Project is unlikely to significantly reduce the area available to this species for foraging.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No. The management measures proposed will reduce the risk of introductions of invasive species to as low as reasonable practicable.
Introduce disease that may cause the species to decline	No. No domestic animals will be allowed on site therefore minimising the risk of introducing disease to the area.
Interfere substantially with the recovery of the species	No. As there is expected to be no loss of critical habitat for this species and breeding is not expected to be disrupted, the Project is unlikely to interfere with the recovery of the species.

3.3.3 Pilbara Olive Python

Potential impacts to the Pilbara Olive Python are expected to be insignificant. Suitable breeding and foraging habitat exists in association with the groundwater fed pools recorded from the Project area and surrounds. No direct impacts to these pools are anticipated as a result of the Project. Site 12 Pool may be indirectly impacted through filling of the upper catchment by the waste rock dump, however, the area of the catchment that may be affected makes up a small portion (less than five percent) of the pool's entire catchment and impacts are therefore expected to be minor and not predicted to affect Pilbara Olive Pythons in this location.

Some clearing of critical habitat is proposed at the Turner River for the proposed Mine Access and Haul Road. The required clearing amounts to 0.6 percent of the mapped extent of the habitat. As no pythons have been recorded in this location and the proposed clearing is a small portion of the mapped extent of the habitat, the potential for significant impact is low.

The Project will result in increased traffic volumes and there is potential for individual pythons to be injured or killed through collisions with vehicles on roads. This is not expected to adversely impact the local population or the survival of the species as a whole. With the implementation of the proposed management measures, the potential for significant impact is low.

Implementation of the Project is unlikely to result in significant impacts to the Pilbara Olive Python.

Table 5 provides a summary of the assessment of the Project against the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DEWHA, 2009). Implementation of the proposed management measures will assist in reducing the risk of impacts to these species to as low as reasonably practicable.



Table 5: Assessment of Impacts to the Pilbara Olive Python against the Significant Impact Criteria (DEWHA, 2009)

Significant Impact Criteria	Pilbara Olive Python
Lead to a long-term decrease in the size of an important population of a species	No. While some habitat associated with the Turner River (0.6 percent of the mapped habitat extent) will be cleared this is considered unlikely to adversely affect Pilbara Olive Pythons in this location.
Reduce the area of occupancy of an important population	No. A small amount of clearing of habitat associated with the Turner River will be required. This is unlikely to adversely affect Pilbara Olive Pythons in this location.
Fragment an existing important population into two or more populations	No. The proposed clearing at the Turner River may fragment the habitat in this location, however no pythons have been recorded from this area.
Adversely affect habitat critical to the survival of a species	No. A small amount of clearing of habitat associated with the Turner River (0.6 percent of the mapped habitat extent) will be required. This is unlikely to adversely affect Pilbara Olive Pythons in this location.
Disrupt the breeding cycle of an important population	No. Areas suitable for breeding are not proposed to be directly impacted by the Project.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. A small amount of clearing of habitat associated with the Turner River (0.6 percent of the mapped habitat extent) will be required. This is unlikely to adversely affect Pilbara Olive Pythons in this location.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No. The management measures proposed will reduce the risk of introductions of invasive species to as low as reasonable practicable.
Introduce disease that may cause the species to decline	No. No domestic animals will be allowed on site therefore minimising the risk of introducing disease to the area.
Interfere substantially with the recovery of the species	No. The loss of a small amount of habitat (0.6 percent of the mapped habitat extent) is unlikely to adversely affect Pilbara Olive Pythons in this location. Additionally habitat suitable for breeding are not proposed to be directly impacted by the Project.

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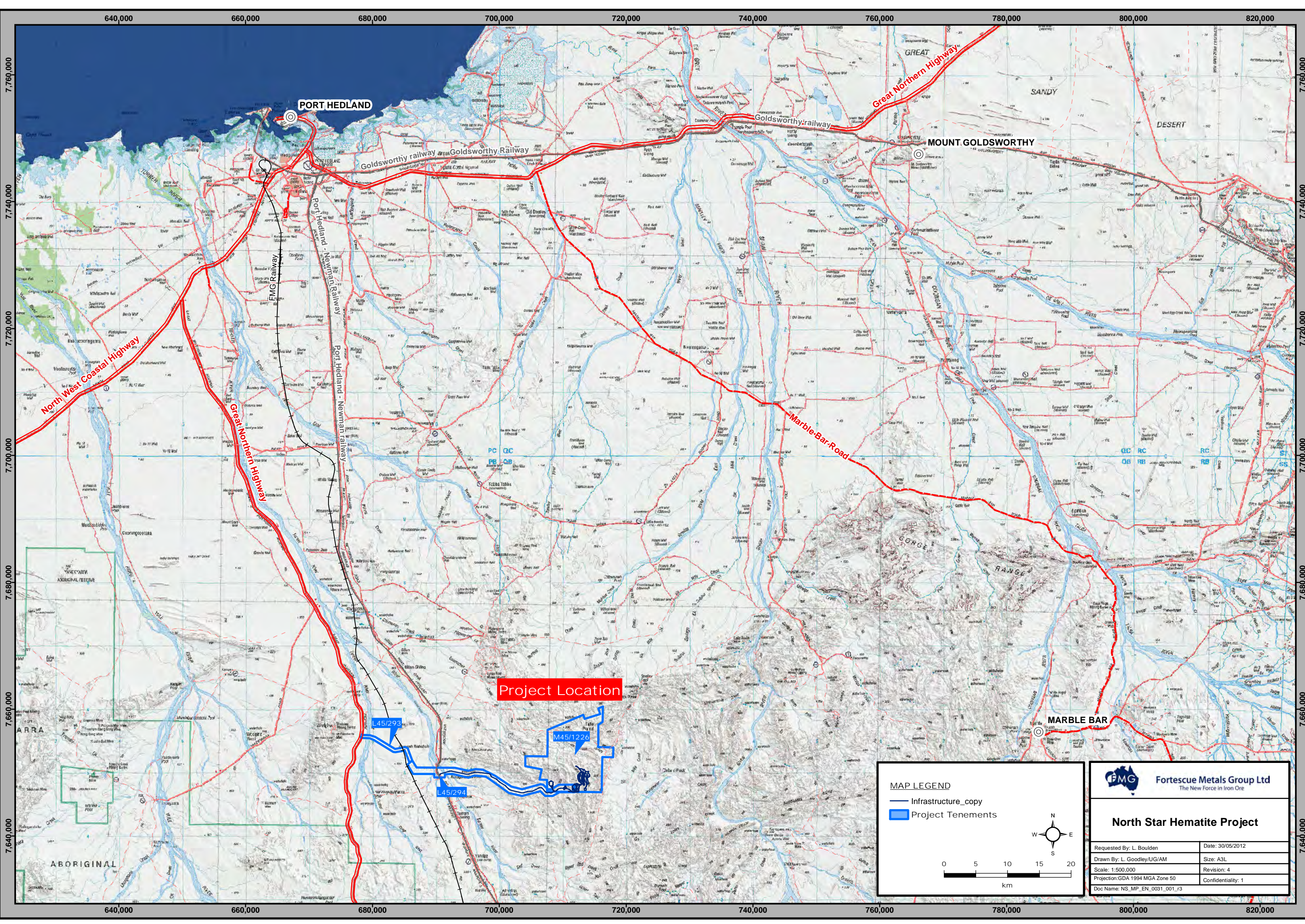
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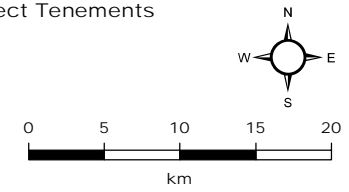
Figure 1: Project Location





MAP LEGEND

- Infrastructure_copy
- Project Tenements



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The New Force in Iron Ore

North Star Hematite Project

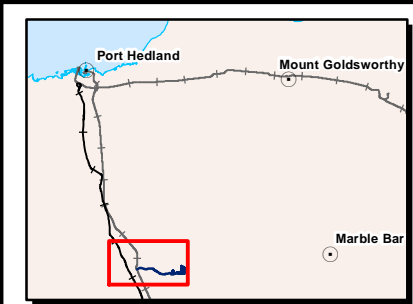
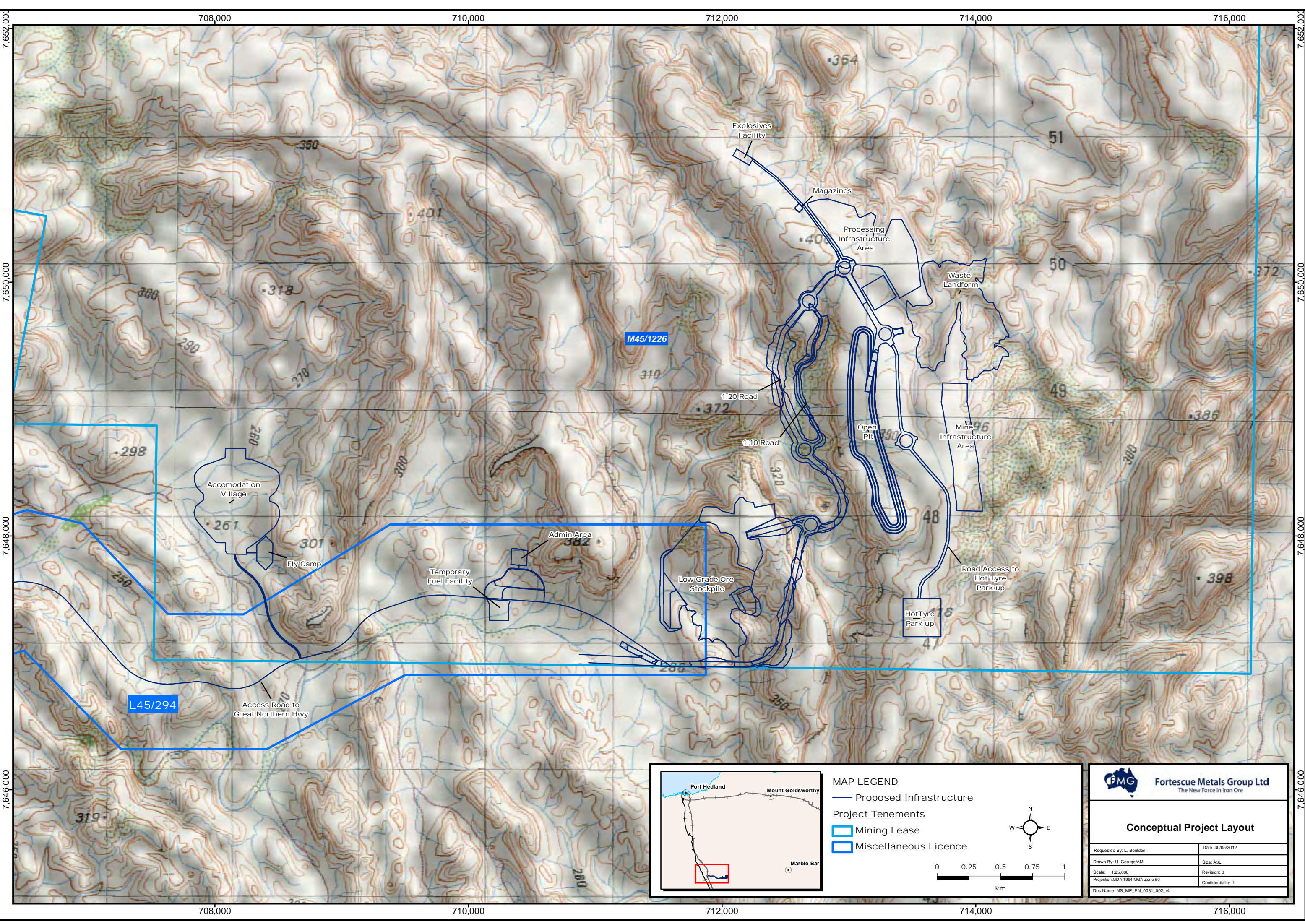
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Doc Name: NS_MP_EN_0031_001_r3	

Figure 2: Conceptual Project Layout

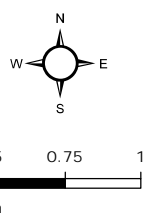


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- MAP LEGEND**
- Proposed Infrastructure
 - Mining Lease
 - Miscellaneous Licence



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Conceptual Project Layout

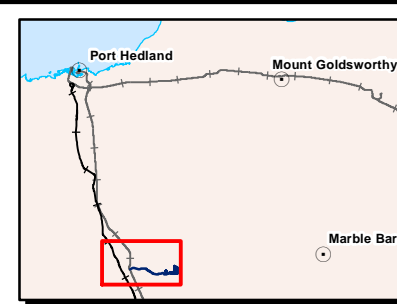
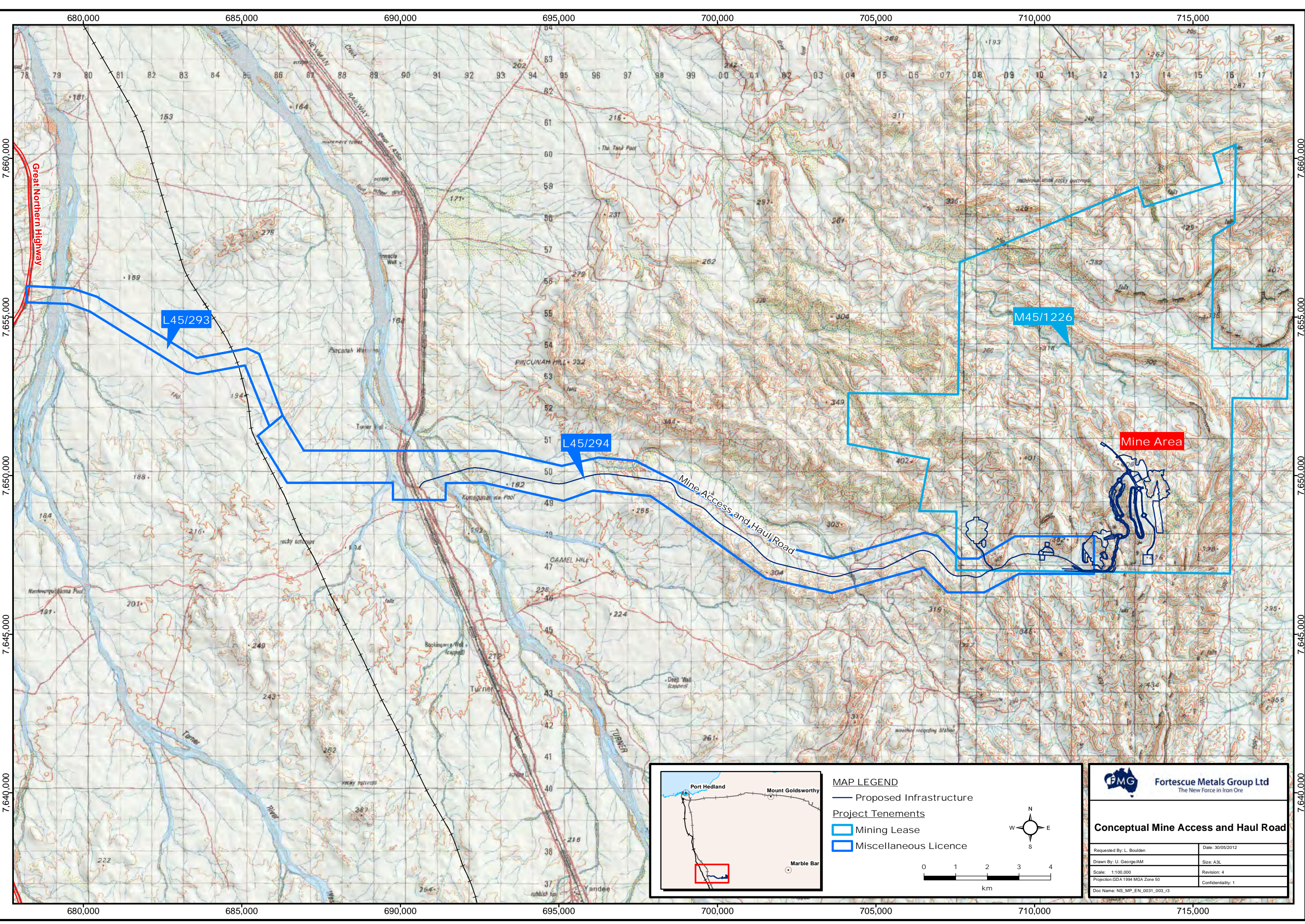
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Figure 3: Mine Access and Haul Road

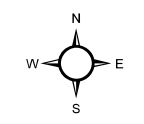



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- MAP LEGEND**
- Proposed Infrastructure
 - Project Tenements
 - Mining Lease
 - Miscellaneous Licence



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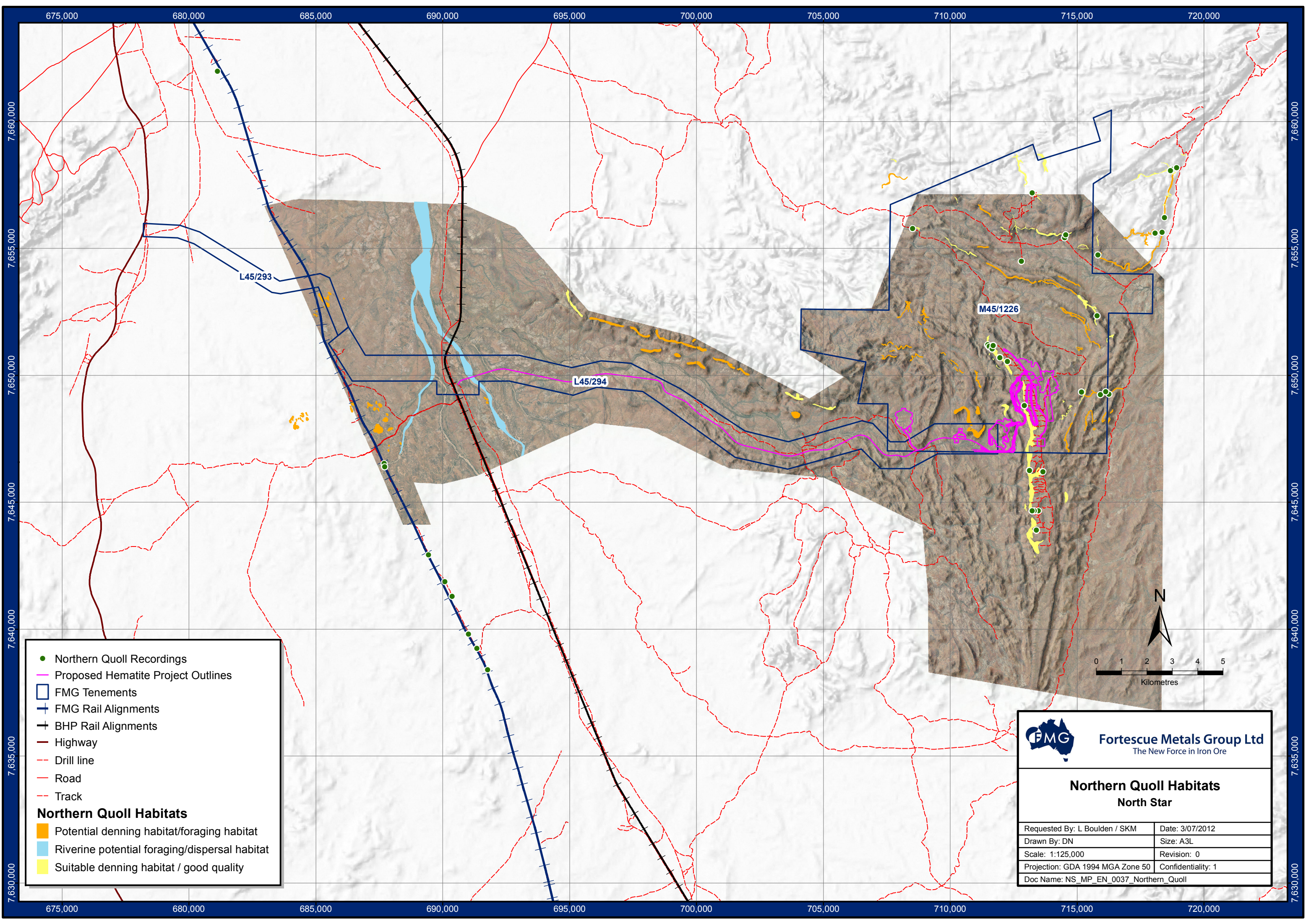
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Doc Name: NS_MP_EN_0031_003_r3	

Figure 4: Northern Quoll Habitat and Records

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Northern Quoll Recordings

Proposed Hematite Project Outlines

FMG Tenements

FMG Rail Alignments

BHP Rail Alignments

Highway

Drill line

Road


Track

Northern Quoll Habitats

Potential denning habitat/foraging habitat

Riverine potential foraging/dispersal habitat

Suitable denning habitat / good quality



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The New Force in Iron Ore

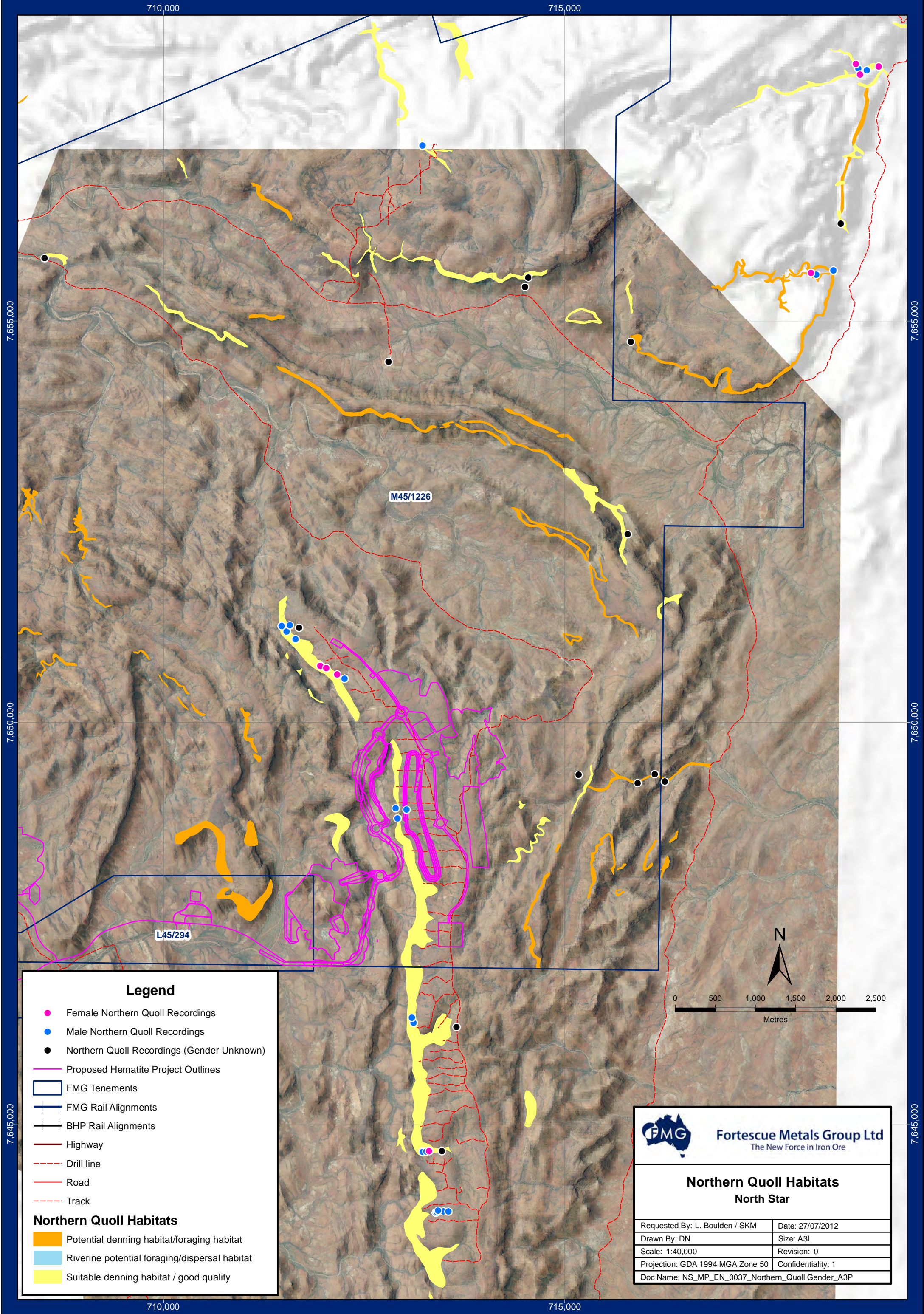
Northern Quoll Habitats
North Star

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Projection: GDA 1994 MGA Zone 50	Confidentiality: 1
Doc Name: NS_MP_EN_0037_Northern_Quoll	

Figure 5: Northern Quoll Records – Mining Area

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Legend

- Female Northern Quoll Recordings
- Male Northern Quoll Recordings
- Northern Quoll Recordings (Gender Unknown)
- Proposed Hematite Project Outlines
- FMG Tenements
- FMG Rail Alignments
- BHP Rail Alignments
- Highway
- Drill line
- Road
- Track

Northern Quoll Habitats

- Potential denning habitat/foraging habitat
- Riverine potential foraging/dispersal habitat
- Suitable denning habitat / good quality



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The New Force in Iron Ore

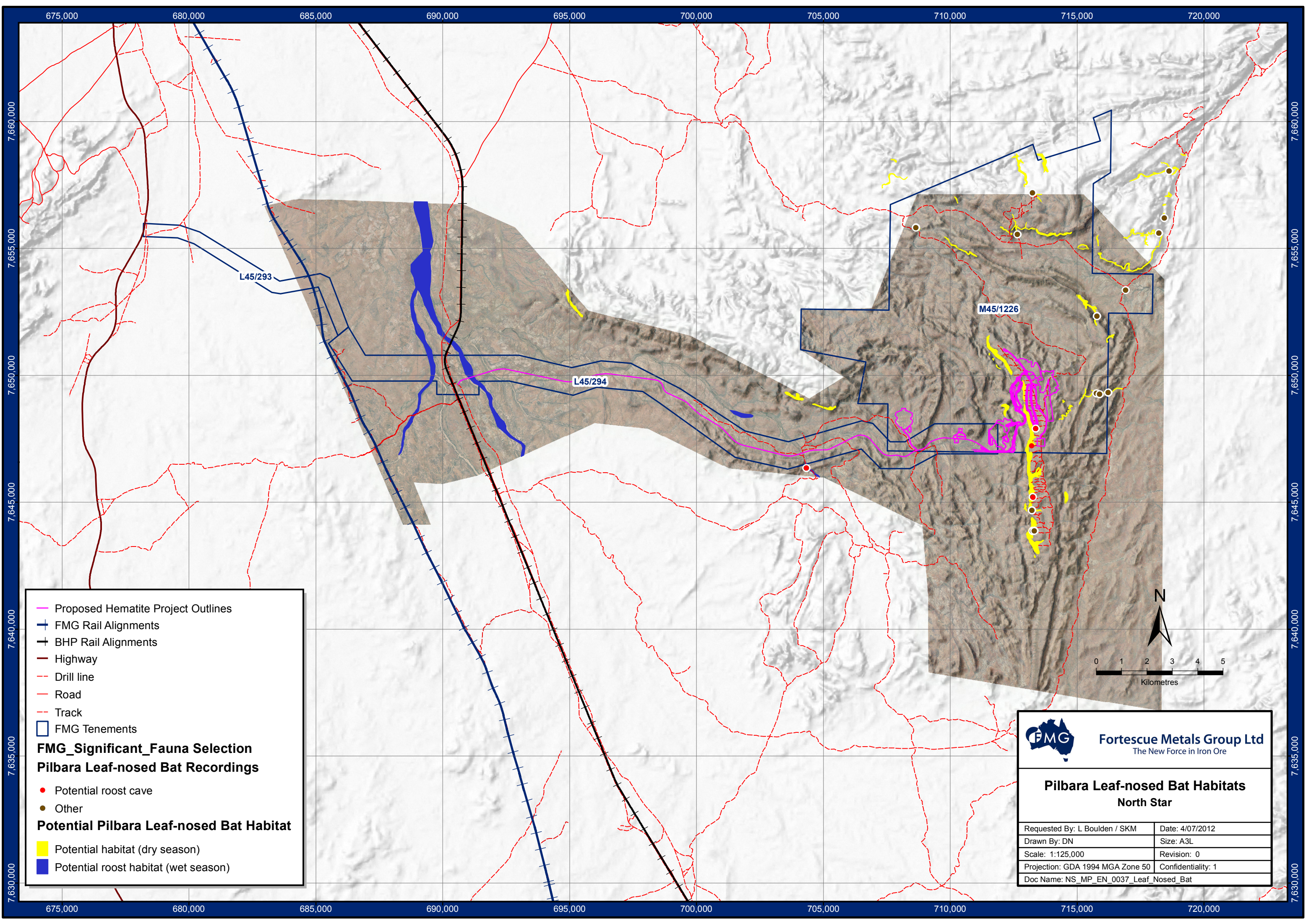
**Northern Quoll Habitats
North Star**

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Doc Name: NS_MP_EN_0037_Northern_Quoll_Gender_A3P	

Figure 6: Pilbara Leaf-nosed Bat Habitat and Records

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— Proposed Hematite Project Outlines

— FMG Rail Alignments

— BHP Rail Alignments

— Highway

— Drill line

— Road

— Track

□ FMG Tenements

FMG_Significant_Fauna Selection

Pilbara Leaf-nosed Bat Recordings


● Potential roost cave

● Other

Potential Pilbara Leaf-nosed Bat Habitat

■ Potential habitat (dry season)

■ Potential roost habitat (wet season)



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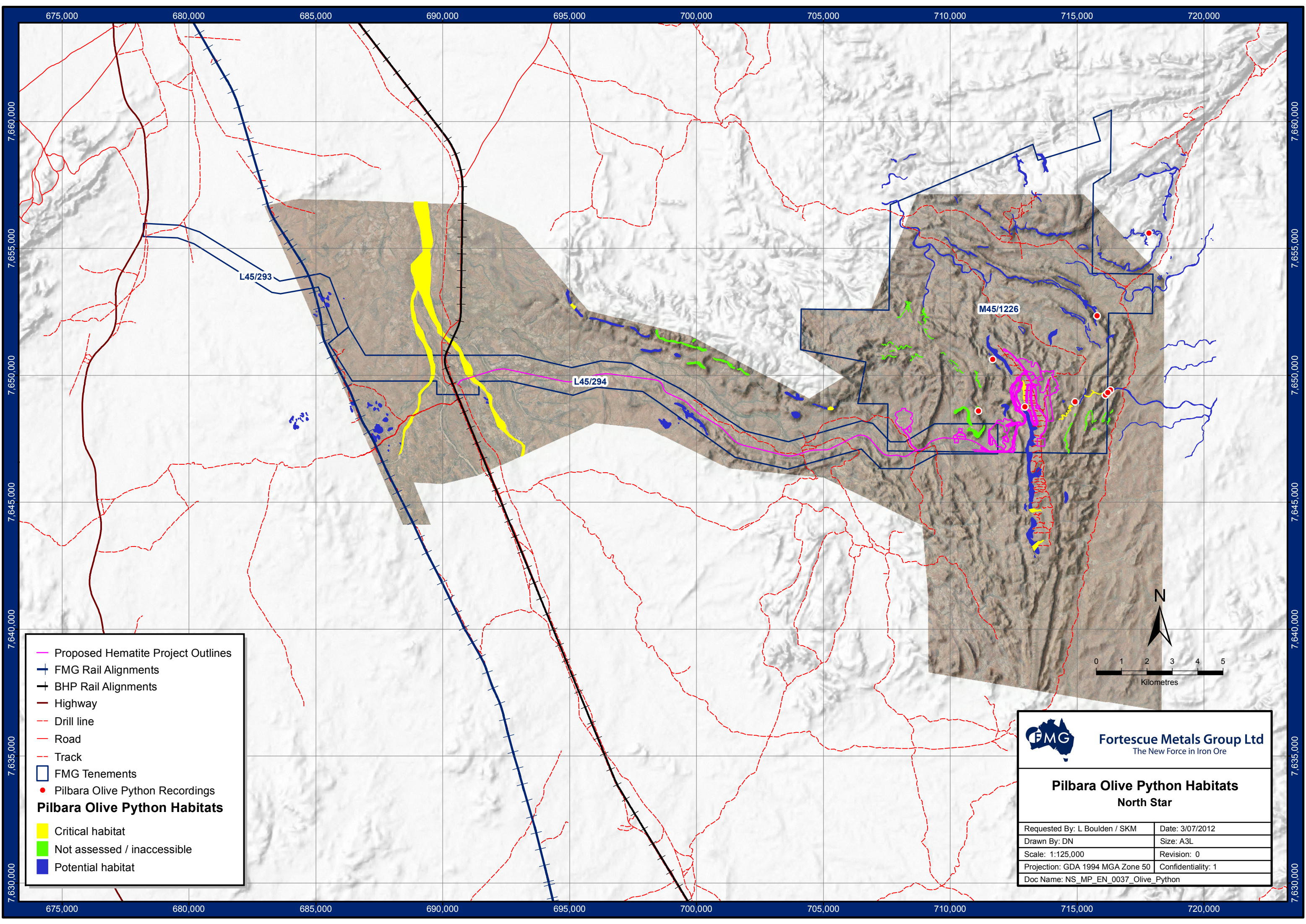
Pilbara Leaf-nosed Bat Habitats
North Star

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Doc Name: NS_MP_EN_0037_Leaf_Nosed_Bat	

Figure 7: Pilbara Olive Python Habitat and Records

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Proposed Hematite Project Outlines

FMG Rail Alignments

BHP Rail Alignments

Highway

Drill line

Road

Track

FMG Tenements

Pilbara Olive Python Recordings

Pilbara Olive Python Habitats

Critical habitat

Not assessed / inaccessible

Potential habitat

FMG

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Pilbara Olive Python Habitats

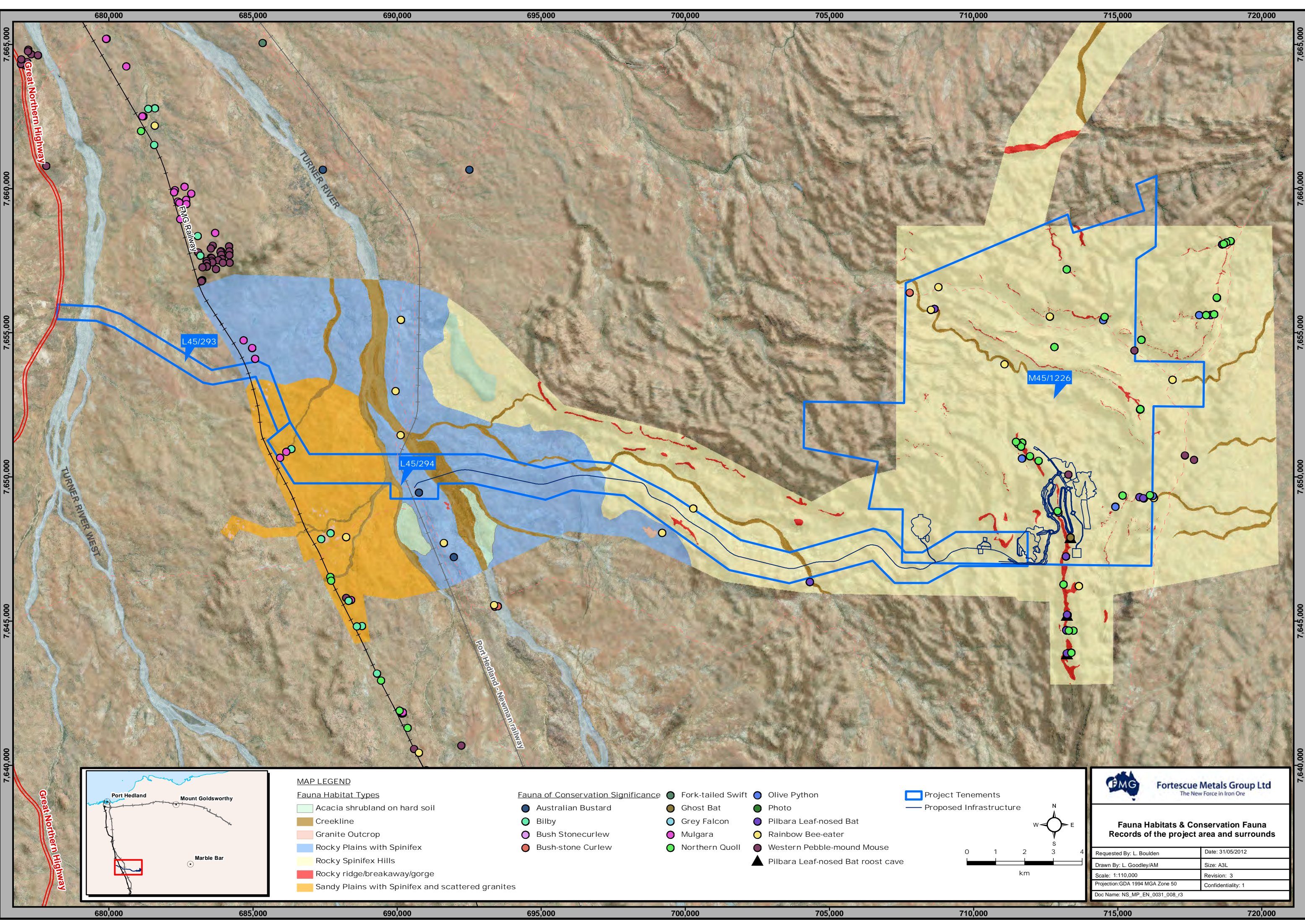
North Star

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Projection: GDA 1994 MGA Zone 50	Confidentiality: 1
Doc Name: NS_MP_EN_0037_Olive_Python	

Figure 8: Fauna Habitats and Conservation Significant Fauna Records

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MAP LEGEND

Fauna Habitat Types

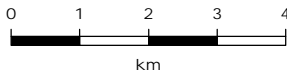
- Acacia shrubland on hard soil
- Creekline
- Granite Outcrop
- Rocky Plains with Spinifex
- Rocky Spinifex Hills
- Rocky ridge/breakaway/gorge
- Sandy Plains with Spinifex and scattered granites

Fauna of Conservation Significance

- Australian Bustard
- Bilby
- Bush Stonecurlew
- Bush-stone Curlew
- Fork-tailed Swift
- Ghost Bat
- Grey Falcon
- Mulgara
- Northern Quoll
- Olive Python
- Photo
- Pilbara Leaf-nosed Bat
- Rainbow Bee-eater
- Western Pebble-mound Mouse
- Pilbara Leaf-nosed Bat roost cave

Project Tenements

- Proposed Infrastructure



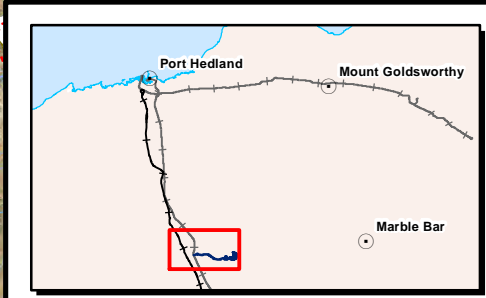
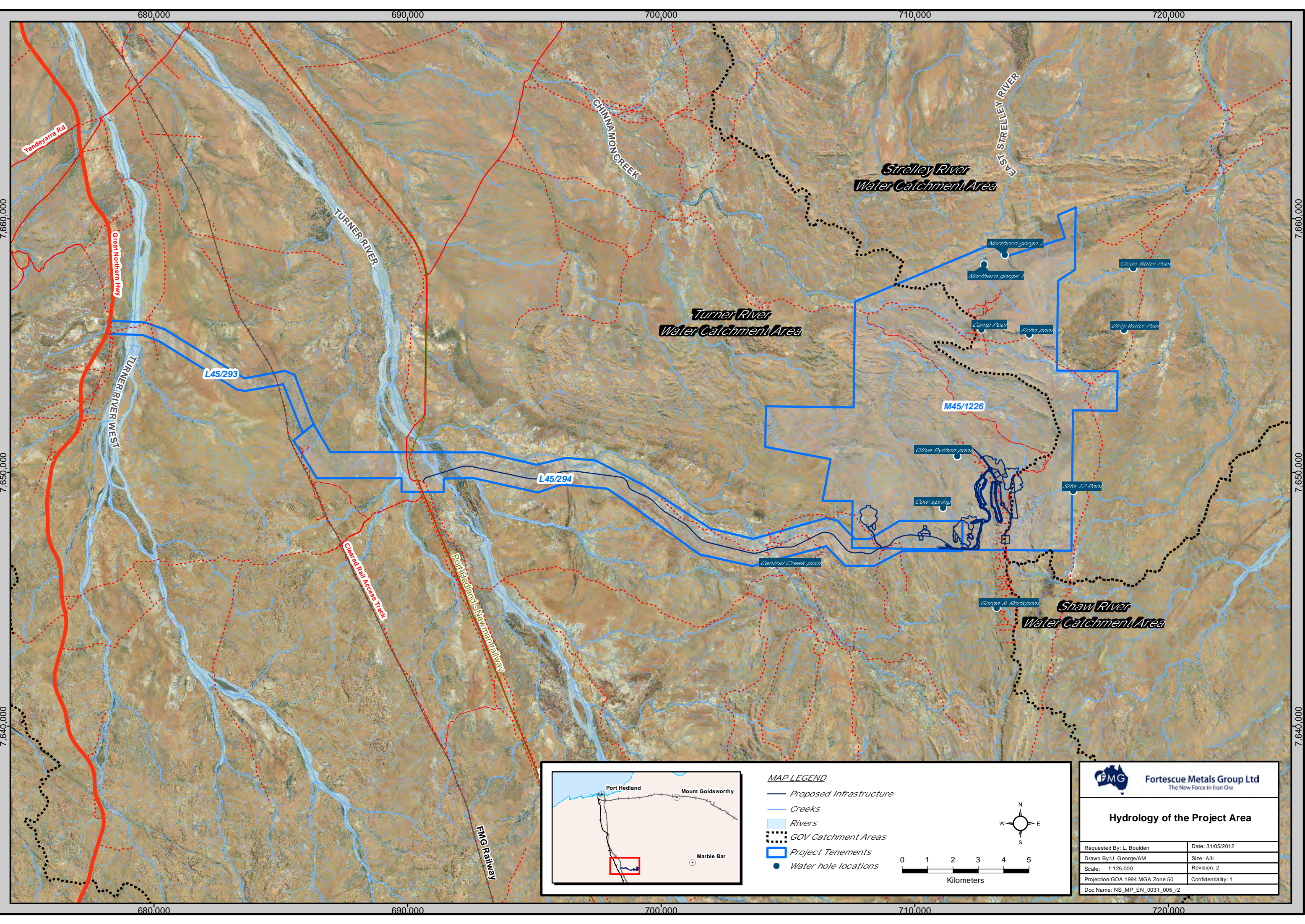
Fauna Habitats & Conservation Fauna
Records of the project area and surrounds

Requested By: L. Bouden	Date: 31/05/2012
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Scale: 1:110,000	Revision: 3
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Doc Name: NS_MP_EN_0031_008_r3	

Figure 9: Hydrology of the Project Area and Surrounds

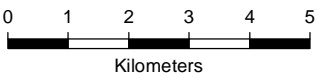
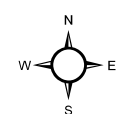
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MAP LEGEND

- Proposed Infrastructure
- Creeks
- Rivers
- GOV Catchment Areas
- Project Tenements
- Water hole locations



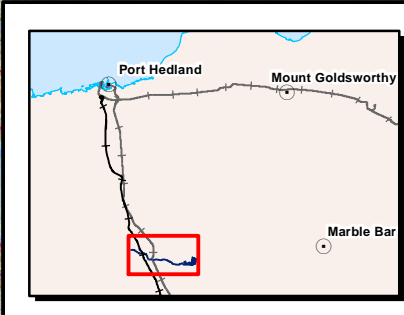
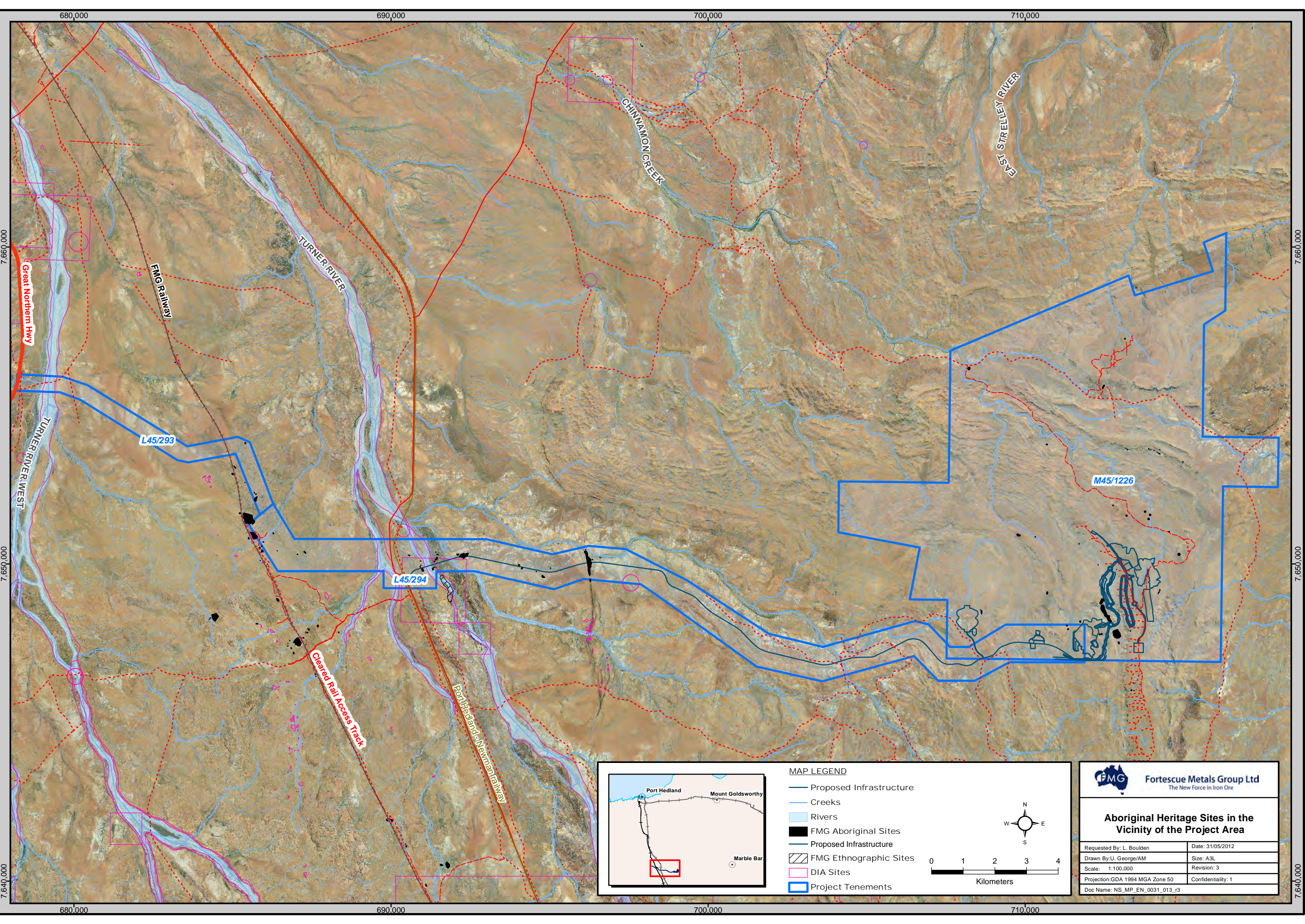
Hydrology of the Project Area

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Projection: GDA 1994 MGA Zone 50	Confidentiality: 1
Doc Name: NS_MP_EN_0031_005_r2	

Figure 10: Aboriginal Heritage Sites

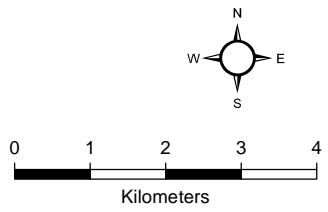
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MAP LEGEND

- Proposed Infrastructure
- Creeks
- Rivers
- FMG Aboriginal Sites
- Proposed Infrastructure
- FMG Ethnographic Sites
- DIA Sites
- Project Tenements



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Aboriginal Heritage Sites in the Vicinity of the Project Area

Requested By: L. Boulton	Date: 31/05/2012
Drawn By: U. George/AM	Size: A3L
Scale: 1:100,000	Revision: 3
Projection: GDA 1994 MGA Zone 50	Confidentiality: 1
Doc Name: NS_MP_EN_0031_013_r3	

Appendix 1: Fauna Surveys (see attached CD)



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Appendix 2: Environmental Policy



