



BHP Pilbara Strategic Assessment


Validation Notice

Mining Area C

14 June 2018



Authorisation

Rev	Description of Amendment	Organisation	Name	Signature	Date
Rev 0		BHP Billiton Iron Ore Pty Ltd	Chris Serginson		14 June 2018

Glossary and Abbreviations

Term	Meaning
Activity or activities	The activity includes Mining Area C mining expansions and South Flank mining and associated infrastructure (Section 2).
Activity Area	The area which the activity/s will be undertaken within and includes Mining Area C exemption areas as described in Section 1.4
Agreement, the	The agreement dated 18 September 2012 (including the Variation to the Agreement dated 21 October 2015) between the Commonwealth Minister for the Environment and BHP for the strategic assessment of the impacts of the Proposal on MNES.
Approval	Means the approval of the taking of an action or class of actions granted by the Minister on 19 June 2017 in accordance with the Program given under section 146B of the EPBC Act.
Approval Holder	Means any person or persons named in an Approval as an Approval Holder who may take action in accordance with the Program.
Assurance Plan	The plan that provides further detail on the process described in the Program, including management of Program Matters, stakeholder management, reporting and auditing requirements and governance arrangements, as approved by [the Minister] on [11 May 2018].
BHP	BHP Billiton Iron Ore Pty Ltd, as manager and agent for and on behalf of BHP Billiton Minerals Pty Ltd, BHP Iron Ore (Jimblebar) Pty Ltd, United Iron Pty Ltd, the participants of the Mount Goldsworthy Joint Venture, Mount Newman Joint Venture and Yandi Joint Venture.
CPWRMP	BHP Central Pilbara Water Resource Management Plan.
Commence, commenced or commencement	Any preparatory works required to undertake a Notifiable Action including clearing, the erection of any onsite temporary structure and the use of heavy duty equipment for the purpose of breaking the ground.
controlling provision	As defined in Part 7 Division 1 section 67 of the EPBC Act.
Department, the	The Australian Government Department responsible for the administration of the EPBC Act or successors.
Direct disturbance	Means the clearing of native vegetation and/or moving of earth as a result of activities undertaken within the Strategic Assessment Area in accordance with the Program.
DoEE	Department of the Environment and Energy.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth).
ESD	Ecologically sustainable development.
Impact or impacts	As defined in section 527E of the EPBC Act.
Full conceptual development scenario	The conceptual direct disturbance footprint for the development of all current BHP mining tenures within the Strategic Assessment Area. Applied in the impact assessment report.

Term	Meaning
Impact Assessment Report or IAR	BHP Billiton Iron Ore Strategic Assessment: Impact Assessment Report (BHP 2016).
Implementation Framework	Comprises this Assurance Plan and the Offsets Plan, which are designed to support the implementation of the Program.
Minister	Minister responsible for administering the EPBC Act and includes a delegate of the Minister.
New Listings	Any new listed threatened species or existing species that have been included in a higher endangerment category identified in accordance with Section 4.1.2 of the Program.
New Matters	Other matters protected by a controlling provision of Part 3 of the EPBC Act (other than listed threatened species) that may be identified in accordance with Section 4.1.2 of the Program.
Notifiable Action	An activity that is considered likely to have a relevant impact on a Program Matter based on an assessment of the proposed activity against the thresholds defined for Program Matters in the Assurance Plan. In relation to the voluntary part of the Program, this includes an activity that is considered likely to have a relevant impact on a New Listing or a New Matter.
Notifiable Action completion	The point at which a Notifiable Action has been implemented in full, such as the time identified in a Validation Notice or at an earlier point as agreed between BHP and the Department.
Offsets Plan	The plan that provides further detail on the processes that will be implemented to identify and deliver offsets associated with a Notifiable Action, as approved by [the Minister] on [11 May 2018].
Other controlling provisions	Any controlling provision under the EPBC Act that is not already considered in accordance with the Program, this Assurance Plan and/or the Offsets Plan.
Practicable	Means reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge.
Program	The BHP Billiton Iron Ore Pilbara Strategic Assessment Program endorsed by the Minister on 11 May 2017. Whilst the Agreement refers to a Plan, it was agreed with the Department that the term Program is a better reflection of the systems and processes to be delivered by BHP.
Program Matters	Means the listed threatened species Pilbara leaf-nosed bat (<i>Rhinocterus australianus</i>), Northern quoll (<i>Dasyurus hallucatus</i>), Greater bilby (<i>Macrotis lagotis</i>), Ghost bat (<i>Macroderma gigas</i>), and Olive python (Pilbara subspecies) (<i>Liasis olivaceus barroni</i>).
Protected Matters	Matters protected by a provision of Part 3 of the EPBC Act.
PMO	Program Matter Outcome.
Strategic Assessment Area	The geographical extent of the assessment and boundaries within which the Program must be implemented, as depicted in Appendix 1.

Term	Meaning
Validation Notice	This Validation Notice under Part C of the endorsed Program.
WC Act	<i>Wildlife Conservation Act 1950</i> (WA).

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1 Introduction

1.1 Background

BHP Billiton Iron Ore Pty Ltd (BHP) currently operates a number of iron ore mines and associated rail and port infrastructure within the Pilbara region of Western Australia (WA). Current mining operations include the:

- Newman Joint Venture (NJV) hub - located approximately two kilometres (km) west of Newman township and consists of Mount Whaleback, and Orebodies 29, 30 and 35;
- Mining Area C – Northern and Southern Flanks - located approximately 100 km northwest of Newman Township;
- Wheelarra Hill (Jimblebar) Mine, Orebody 18 and Orebody 31 (Jimblebar hub) - located approximately 35 km east of Newman township;
- Eastern Ridge hub - located approximately 5 km east of Newman township and consists of Orebodies 23, 24, 25 and 32; and
- Yandi Mine - located approximately 100 km north northwest of Newman township.

Ore from the NJV hub, Mining Area C – Northern and Southern Flanks, Jimblebar hub, Eastern Ridge hub and the Yandi mine is transported by rail to Port Hedland via the BHP Newman to Port Hedland Mainline (and associated spur lines). Ore is then shipped overseas via Port Hedland at the BHP facilities at Nelson Point and Finucane Island.

1.2 Framework

The BHP Pilbara Strategic Assessment Program was endorsed by the Minister for the Environment and Energy on 11 May 2017 and an Approval Decision (the Approval) for taking actions in accordance with the Program was issued on 19 June 2017. The Approval applies to the development of new iron ore mines and associated infrastructure and the expansion of existing iron ore mines and associated infrastructure within a defined Strategic Assessment Area (Appendix 1). Key commitments of the endorsed Program and conditions of approval include preparation and approval of an Assurance Plan and Offsets Plan, and undertaking a validation process including preparation of a Validation Notice for each Notifiable Action undertaken in accordance with the Program.

The Assurance Plan, which was approved on 11 May 2018 defines the environmental objectives, procedures and governance arrangements to ensure that all future activities within the scope of the Program are undertaken in accordance with the endorsed Program and achieve the Program's objectives. The Plan includes Program Matter Outcomes which are measureable outcomes that BHP must meet to achieve the objectives developed for each Program Matter. Notifiable Action triggers are set out within the plan to prompt the requirement for a Validation Notice.

The Offsets Plan, which was approved on 11 May 2018, ensures that appropriate offsets are applied to address residual adverse impact(s) of actions under the Program at an appropriate time. In accordance with Part C of the Program, BHP has undertaken a validation process for the Mining Area C – Northern and Southern Flank Program activity, to ensure that the Program Matter Outcomes are met across the Strategic Assessment Area.

For an activity to require a Validation Notice, the activity must:

- be within the scope of the Program; and
- meet one or more of the Notifiable Action triggers identified in the Assurance Plan.

1.3 Program, Assurance Plan and Offsets Plan Requirements

The endorsed Program, Assurance Plan and Offsets Plan specifies the requirements and content of the Validation Notice.

Table 1.1: Content of Validation Notice

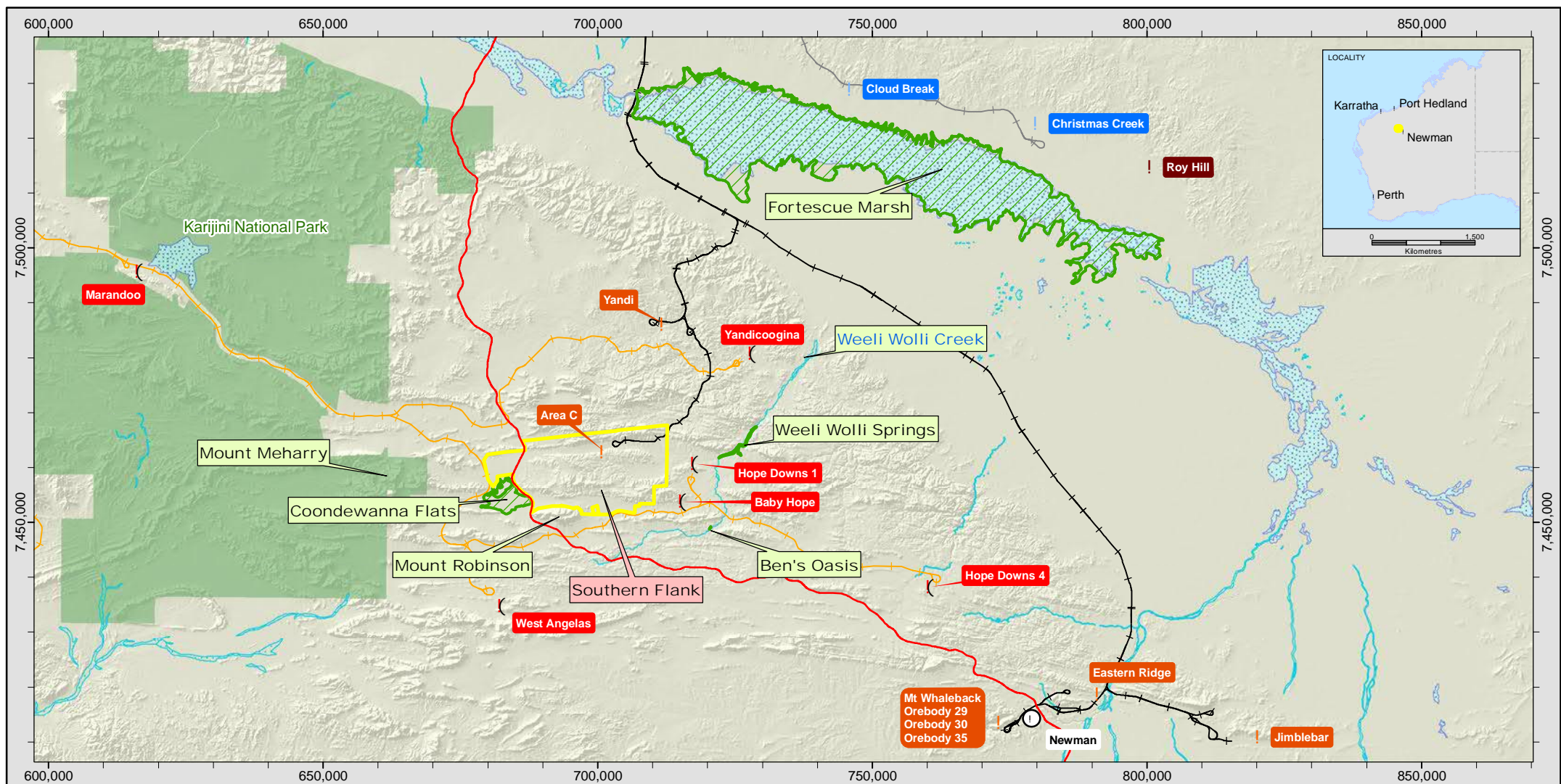
	Strategic Assessment Program, Assurance Plan and Offsets Plan Requirements	Sections which address these Requirements
1	Decision whether a validation notice is required for the activity	0
2	BHP authorisation and date the Validation Notice will take effect	Foreword
3	Program Matters and triggers relevant to the Validation Notice	0 and 4
4	Project description including activity location and timeframes for the duration of activities	1.6 and 2
5	Stakeholder engagement and public consultation	3
6	Review of baseline and contemporary data with a description of the direct and indirect impacts	4
7	Estimates of disturbance and residual impacts	2 and 4
8	Application of the mitigation hierarchy	4
9	Outline the objective/s of the offset project/s, consistent with the scope of actions to offset impacts stated in the Program and Offsets Plan	5
10	Outline how the offset project/s will support the long-term persistence and viability of the relevant Program Matters	5
11	Commitment to measurable offset project milestones	5

1.4 Activity to which this Validation Notice applies

The Mining Area C – Northern and Southern Flanks mining operation is located approximately 100 km northwest of the Newman township, in the Pilbara region of Western Australia (Figure 1.1). The Southern Flank orebody is located approximately 8 km south of BHP's current Mining Area C operations at Packsaddle and Northern Flank. BHP has prepared the Validation Notice for the development and operation of the Mining Area C expansion areas and Southern Flank satellite ore body (Figure 1.2 and Section 2).

The Mining Area C existing operations within the activity area are outside the scope of the Program as described in Section 2.3 of the Program via the following:

- The areas were approved by Western Australia Department of Water and Environment Regulation (DWER) under Part IV of the *Environmental Protection Act 1986* (WA) under Ministerial Statement 491 dated 24 December 1998; and
- The Mining Area C existing operations did not impact the listed matters of National Environmental Significance species at the time of approval.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Central Pilbara Overview

Scale @ A4: 1:1,000,000	Prepared: M. LYTTLE	Project No: A780/100 REV A
Date: 21/03/2018	Checked: G. MANNING	Figure: 1.1
Revision: REV A	Reviewed: K. FLOWERDEW	

① Town

Major Active Iron Ore Mines

- ! BHP Billiton
- ! Fortescue Metals Group
- ! Rio Tinto
- ! Roy Hill Holdings

Environmental Receptors Relevant to Proposal

▨ Priority Ecological Community

▨ Prescribed Premise Boundary (L7851)

— Great Northern Highway

— BHP Billiton Rail

— FMG Rail

— Rio Tinto Rail

▨ Watercourse Areas - Non-perennial

▨ Land Subject To Inundation

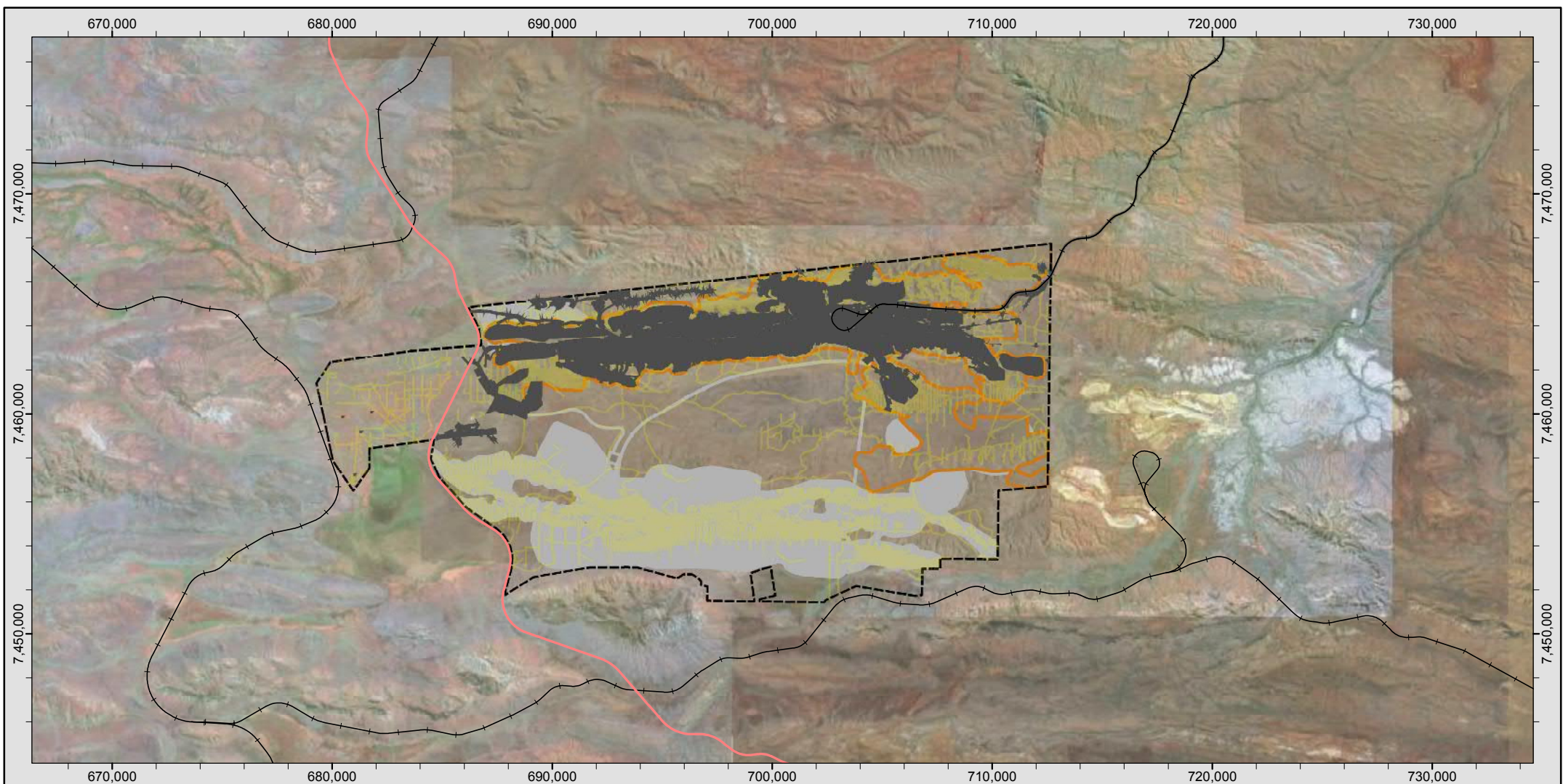
▨ Karijini National Park

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0 20 40 60
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Activity Area

Scale @ A4: 1:250,000	Prepared: M. LYTTLE	Project No: A780/146 REV A
Date: 8/06/2018	Checked: E. DRAIN	Figure: 1.2
Revision: Final	Reviewed: K. FLOWERDEW	

— Great Northern Highway
— Existing Rail

--- Mining Area / Southern Flank Activity Area

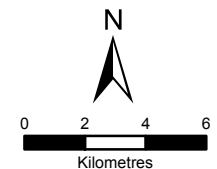
■ Mining Area C Expansion

■ Exploration Clearing

■ Mining Area C Exemption

■ Southern Flank

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

The Mining Area C expansions and Southern Flank mining and infrastructure outlined in Section 2 are hereafter referred to as the activity. The activity excludes Mining Area C existing operations. The activity area is the area where the activity will be undertaken. The area includes Mining Area C existing operations and expansions and Southern Flank mining and infrastructure.

1.5 Decision for a Validation Notice

A Validation Notice is required for actions that are notifiable, in accordance with notifiable action triggers set out in the Assurance Plan and reproduced in Table 1.2. The Mining Area C is a notifiable action as it fulfils the triggers of the Assurance Plan for the greater bilby (*Macrotis lagotis*), Pilbara olive python (*Liasis olivaceus barroni*), Pilbara leaf-nosed bat (*Rhinonictus aurantia*), northern quoll (*Dasyurus hallucatus*) and ghost bat (*Macroderma gigas*). The Validation Notice will demonstrate how the implementation and operation of the activity will meet each of the Program Matter Outcomes (PMOs).

Amendments to the Threatened Species List effective under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 15 February 2018 included the delisting of *Lepidium catapycnon*. Under Section 4.1.1 of the Program, BHP is not required to continue to manage any species under the Program Matters that has become delisted. On this basis, no validation of impacts to *Lepidium catapycnon* has been undertaken for the activity.

Table 1.2: Notifiable Action Triggers and Mining Area C

Program Matter	Relevant Notifiable Action trigger	Mining Area C Program Matter Data
Greater Bilby <i>Macrotis lagotis</i>	Presence of Greater Bilby habitat ¹ within or adjacent ² to the activity; or	1,246 ha of sand plain habitat, within the activity area.
	Presence ³ of Greater Bilby individuals within or adjacent to the activity; or	No evidence of greater bilby within or adjacent to the activity area.
	A recorded Greater Bilby population or habitat within or adjacent to the activity; or	No records of greater bilby during the on ground baseline surveys. Nearest record 75 km north of the activity area, but most records occur 150 km north. Currently no records known from the Hamersley Range.
	A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Greater Bilby ⁴ .	Not applicable to this activity.
Northern Quoll <i>Dasyurus hallucatus</i>	Presence of Northern Quoll habitat ⁵ within or adjacent ⁶ to the activity; or	2,105 ha of gorge and gully habitat and 135 ha of major drainage line habitat within the activity area.
	Presence ⁷ of Northern Quoll individuals within or adjacent to the activity; or	Records of northern quoll scats from two locations. No northern quoll images captured via trapping or motion detection camera surveys. Surveys undertaken as per DoEE Guidelines.

¹ Determined by baseline survey. Habitat as defined in the National Recovery Plan for the Greater Bilby.

² For the purpose of the Greater Bilby, *adjacent to* means within 1 kilometre from the activity.

³ Presence is detected with evidence of greater bilby scat, digging, track, etc

⁴ Circumstances may include site specific matters related to potential indirect impacts identified in Section 3.3 of the Assurance Plan

⁵ Determined by baseline survey. Habitat as described in the National Recovery Plan for the Northern Quoll.

⁶ For the purpose of the Northern Quoll, *adjacent to* means within 1 kilometre from the activity.

⁷ Presence is demonstrated with evidence of northern quoll scat, digging, track, etc

Program Matter	Relevant Notifiable Action trigger	Mining Area C Program Matter Data
	A recorded Northern Quoll population or habitat within or adjacent to the activity; or	Record of one individual northern quoll from 5 km east of the activity area.
	A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Northern Quoll.	Not applicable to this activity.
Pilbara Leaf-nosed Bat <i>Rhinonicterus aurantia</i>	Presence of Pilbara leaf-nosed bat roosting or foraging habitat ⁸ within or adjacent ⁹ to the activity; or	2,105 ha of gorge and gully habitat within the activity area. Several surface water pools within the activity area.
	Presence ¹⁰ of Pilbara leaf-nosed bat individuals within or adjacent to the activity; or	Confirmed echolocation records of a single call from the Pilbara leaf-nosed bat from two locations.
	A recorded Pilbara leaf-nosed bat population or habitat within or adjacent to the activity; or	Single records only from two locations. Nearest roosts considered to be at Koodaideri (35 km north) or Kalgan Creek (76 km southeast).
	A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Pilbara leaf-nosed bat.	Not applicable to this activity.
Ghost Bat <i>Macroderma gigas</i>	Presence of Ghost Bat roosts ¹¹ or foraging habitat within or adjacent ¹² to the activity, or	Area and location of foraging habitat unknown. Applying a buffer of 4 km around high value roosts it is estimated that up to 20,920 ha of ghost bat foraging habitat is present within the activity area.
	Presence ¹³ of Ghost bat individuals within or adjacent to the activity; or	63 caves have been recorded. 25 are considered to be suitable for use as a day or maternity roost or have shown continual use by ghost bats over multiple years.
	A recorded Ghost Bat population or habitat within or adjacent to the activity; or	Continual ghost bat presence has been recorded within the activity area since 2010.
	A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Ghost Bat.	Not applicable to this activity.
Pilbara Olive Python <i>Liasis olivaceus barroni</i>	Presence of Pilbara olive python habitat ¹⁴ within or adjacent ¹⁵ to the activity; or	2,105 ha of gorge and gully habitat and 135 ha of major drainage line habitat within the activity area. Several surface water pools within the activity area.
	Presence ¹⁶ of Pilbara olive python individuals within or adjacent to the activity; or	Presence recorded via probable Pilbara olive python scats from two locations

⁸ Determined by baseline survey. Roosting habitat is defined as Priorities 1-4 in the Conservation Advice

⁹ For the purpose of the Pilbara leaf-nosed bat, *adjacent to* means (a) within 10 kilometres from the activity or (b) to the extent of a modelled groundwater drawdown from implementing the activity.

¹⁰ Presence is demonstrated with evidence of Pilbara leaf-nosed bat scat, bat survey data etc

¹¹ Determined by pre-disturbance survey. Roosting habitat as described in the Conservation Advice for the Ghost bat.

¹² For the purpose of the Ghost bat, *adjacent to* means (a) within 5 kilometres from the activity and (b) to the extent of a modelled groundwater drawdown from implementing the activity.

¹³ Presence is detected with evidence of Ghost bat guano, bat survey data, etc.

¹⁴ Determined by baseline survey. Habitat as defined in Conservation Advice for the Pilbara olive python.

¹⁵ For the purpose of the Pilbara olive python, *adjacent to* means (a) within 1.5 kilometres from the activity and (b) to the extent of a modelled groundwater drawdown from implementing the activity.

¹⁶ Presence is detected with evidence of Pilbara olive python scat, track, etc

Program Matter	Relevant Notifiable Action trigger	Mining Area C Program Matter Data
	A recorded Pilbara olive python individual or habitat within or adjacent to the activity.	Confirmed record of the Pilbara olive python (deceased) within the activity area. Three records from within 10 km.
	A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Pilbara olive python.	Not applicable to this activity.

1.6 Timeframes

This Validation Notice takes effect 20 business days from the date of authorisation (see declaration and authorisation page). If the notifiable action has not substantially commenced within a period of five-years from that authorisation, BHP or a subsequent Approval Holder must not implement the action until either:

- The Department authorises commencement of the action by BHP or the Approval Holder; or
- BHP issues a new Validation Notice for the action in accordance with this Program. This process extends the commencement timeframe for another five years.

The activity, including construction, operation and closure, is forecast to be completed within approximately 50 years from the date of this notice.

2 Project Description

Mining at activity area will be undertaken utilising conventional open-cut mining for iron ore. Mining involves drilling, blasting, and categorisation of blasted material into iron ore or waste rock. The key components of the activity are:

- Open-cut mining and overburden storage areas (OSAs) at the Mining Area C expansion pits and Southern Flank satellite orebody;
- Primary crushing of ore at the Southern Flank satellite orebody;
- Transportation of ore mined at Southern Flank via overland conveyor to stockpiles and ore handling facilities located at the Mining Area C hub;
- Dewatering of the satellite orebody aquifers and the preferential use of the water for operational purposes, otherwise to manage the surplus volumes via managed aquifer recharge or infiltration basins, as outlined in the Central Pilbara Water Resource Management Plan (CPWRMP) and its revisions;
- Mobile equipment maintenance (MEM) Precinct. The Precinct will include; a warehouse delivery and laydown area, tyre storage and exchange facility, waste water tanks, maintenance workshop, wash-down facility and parking;
- Southern Flank ammonium nitrate (AN) products facility; and
- Access and haul roads.

The following listed infrastructure will be constructed and operated at the existing Mining Area C hub to support the mining activities at Southern Flank. The majority of these activities will be undertaken on ground previously disturbed by Mining Area C existing operations as described in Section 1.4

- The existing Mining Area C hub infrastructure and facilities will be expanded with a new ore handling plant (OHP) to achieve a nominal combined processing rate of 150 million tonnes per annum (Mtpa) of blended ore;
- A new bin type dual gate train load out 2 will be constructed which will tie into a new rail loop outside of the existing rail loop at Mining Area C;
- The rail loop at Mining Area C will be duplicated and realigned to deliver up to 150 Mtpa of product from Mining Area C. Ore will be railed to Port Hedland on BHP's existing network; and
- Electricity is supplied to Mining Area C via a single 33 kV overhead transmission line, from the 132/33 kV Junction Substation, located at the eastern end of ML281SA. Electricity is drawn from the Yarnima power station at Newman. Power will be supplied to the Southern Flank mining area and the new OHP at Mining Area C via two new 132 kV transmission lines from the Junction Substation.

Disturbance of approximately 16,000 ha will be required for the activity, from the Strategic Assessment Area upper disturbance limit of 110,000 ha (limit as outlined within Section 2.4 of the Program and Condition 7 of Annexure 2 of the Approval).

2.1 Mining Method

Mining at the activity area will be undertaken utilising conventional open-cut mining for iron ore in accordance with the mine plan. Mining involves drilling, blasting and categorisation of blasted material into iron ore or waste rock. Approximately 1,850 million tonnes (Mt) of iron ore is estimated to be mined over the life of mining at Mining Area C.

2.2 Ore Processing and Transport

Ore from the Southern Flank orebody will be processed through two primary crushing (PC) facilities, PC1 and PC2, each with a nameplate capacity of 40 Mtpa. The two primary crushing stations will have a dual truck dump apron

located at the top of a mechanically stabilised earth wall designed to accept ultra-class mining trucks of up to 363t capacity. The mining trucks will feed into the Run of Mine (ROM) bin located over a gyratory crusher that will crush the iron ore to a -250 mm top size. The crusher will discharge to a surge vault directly beneath. An apron feeder draws ore from the surge vault and loads the discharge conveyor, which feeds onto the overland conveyor (OLC) system. Three new overland conveyors will transport primary crushed ore from the primary crushing facilities at Southern Flank to the new coarse ore stockpile (COS) at Mining Area C. The mining operations will be supported by expanded infrastructure and facilities at the existing Mining Area C hub up to a nominal combined processing rate of 150 Mtpa of blended ore.

2.3 Overburden Management

Overburden will be stockpiled in OSAs or will be progressively placed back into the pit void, in accordance with the mine plan.

The likelihood of encountering small volumes of potentially acid-forming (PAF) material is low given the lithologies underlying the Southern Flank orebody (i.e. Mount McRae Shale). Technical studies to assess the likelihood of encountering PAF and a broader assessment of acid and metalliferous drainage (AMD) risk have been carried out.

2.4 Mine Dewatering, Water Use and Disposal of Surplus Water

The activity will require mine dewatering (i.e. groundwater abstraction) to facilitate dry mining conditions. During operations, the abstracted water will be used preferentially to supply the mines water requirements. Surplus water not used at the mining operations will be managed in accordance with the CPWRMP. This Plan includes the following hierarchy of management options for managing surplus water:

- reused on-site in mining operations;
- transferred to other nearby operations for use onsite; or
- returned to the aquifer via managed aquifer recharge initially at Juna Downs or via infiltration basins.

2.5 Commissioning

A two-year load-commissioning period will be required for the new activity infrastructure. Load commissioning includes the progressive introduction of process material and/or service load to test the Plant and Equipment under full load operating conditions. During this phase it is required that the Plant and Equipment be tuned and optimised until it achieves a steady, reliable state of operation. Commissioning will be staged as various components of the infrastructure are completed. Performance testing and reliability testing is undertaken during the commissioning phase. Commissioning shall verify that the facilities are capable of continuously operating to design criteria and specifications.

2.6 Closure and Decommissioning

A Mine Closure Plan has been developed in consultation with the Department of Mines, Industry Regulation and Safety (DMIRS). This document outlines the proposed decommissioning, rehabilitation and closure strategy for existing Mining Area C operations and Southern Flank. Recognising the importance of mine planning in facilitating the completion criteria for rehabilitation has been critical in planning and implementing successful rehabilitation practices. Embedding closure and rehabilitation planning in the *Life of Asset* and *5 Year Planning* process for the business has resulted in rehabilitation being included as part of the mining process rather than being considered an add on or separate part of mining. This allows identification of areas available for rehabilitation so that plans for executing final landform earthworks and rehabilitation within the subsequent five year timeframe are integrated with mine plans. To allow appropriate landform design, planners now use waste characterisation information and with site input, model design options to identify the most appropriate rehabilitation plan for any given situation.

BHP is required to review and revise the Mine Closure Plan in accordance with State legislation and as outlined by Condition 9 of Ministerial Statement 1072 for Mining Area C (including Southern Flank).

3 Stakeholder Engagement

BHP's commitment to community engagement is articulated in the Company's *Code of Business Conduct* (BHP 2016a), which states:

Our ability to build relationships and work collaboratively and transparently with our host communities is critical to our long-term success. BHP Billiton aims to be valued and respected by the communities in which we operate.

To support this commitment, BHP has comprehensive Company standards and dedicated resources to ensure its activities are underpinned by continuous community engagement and feedback.

BHP undertakes regular and ongoing stakeholder engagement as part of its core business activities. BHP's *Our Requirements*¹⁷ sets out the Company's approved mandatory and minimum performance requirements for community engagement (BHP 2016b). BHP aims to facilitate regular, open and honest dialogue to understand expectations, concerns and interests of stakeholders and to incorporate them into business planning to help build strong, mutually beneficial relationships.

3.1 Stakeholder Consultation

BHP is required to maintain a register of interested parties for the purpose of stakeholder consultation. Interested parties have been identified through the formal Strategic Assessment public consultation period or have self-identified after the consultation period. Members of the community and groups are able to self-identify through local stakeholder engagement activities such as Community Consultative Groups in Port Hedland and Newman, and regular meetings with Traditional Owner groups and non-government organisations, or through www.bhp.com/contact. The BHP community team will advise on any enquiries or requests to be included in stakeholder engagement activities relating to the Strategic Assessment.

Key regulatory authorities, including the Department of the Environment and Energy, and target stakeholders were consulted during the development of the draft Validation Notice. Consultation outlined the SEA approval, proposed submission, including a description of proposed activities of the Notifiable Action, the potential impacts on the Program Matters and the proposed management approach. The stakeholders consulted and level of stakeholder engagement undertaken depended on the location, complexity, size and risk of the particular activity, and the level of stakeholder interest. Table 3.1 summarises the relevant consultation undertaken by BHP regarding the aspects of this validation notice.

3.2 Public Consultation

BHP has made the draft Validation Notice publicly available on its website for a minimum period of 28 days. The public consultation period commenced on the 15 May 2018.

A summary of the engagement undertaken for the Validation Notice, including the public consultation period, is included in Table 3.1.

¹⁷ BHP *Our Requirements* documents set out minimum company standards, processes and procedures that must be met across the globe.

Table 3.1: Stakeholder Engagement

Stakeholder	Date	Description	Topics Discussed	BHP Response
Banjima	28 Sept 2017	Implementation Committee and Environment sub-committee Meeting ¹⁸	<ul style="list-style-type: none"> Southern Flank closure Strategy workshop. Detailed discussion on closure options and sought Banjima input and feedback. Update on the Strategic Assessment. Southern Flank approval update. 	Ongoing commitment from BHP to continue engagement
	19 October 2017	Implementation Committee and Environment sub-committee Meeting	<ul style="list-style-type: none"> Southern Flank approval update. Update on the Strategic Assessment. 	Ongoing commitment from BHP to continue engagement
	2 December 2017 and 22 January 2018	Invitation to comment on the draft Assurance Plan and Offsets Plan	<ul style="list-style-type: none"> Submission from Banjima relating to future opportunities to work with BHP Billiton Iron Ore on land management. 	BHP in early concept phase of land management project.
Nyiyaparli	10 October 2017	Nyiyaparli Environmental Subcommittee Meeting ¹⁸	<ul style="list-style-type: none"> Update on the Strategic Environmental Assessment Recent and current approvals. Upcoming Projects. Follow-up opportunities from SEA consultation. 	Ongoing commitment from BHP to continue engagement
Department of Environment and Energy (DoEE)	11 April 2018 and ongoing	Meeting	<ul style="list-style-type: none"> Review of Assurance Plan, Offsets Plan and Validation Notice. Review of the PMOs. 	Further review of the Assurance Plan, Offsets Plan and Validation Notice.
	8 June 2018	Phone Conference	<ul style="list-style-type: none"> Agreement for BHP to continue with the validation process Potential for ongoing reviews of the Assurance Plans Regional approaches to monitoring of populations 	BHP will continue to consult with the Department with regards to the Validation Notice and Offsets proposals
Department of Water and Environmental Regulation (DWER)	26 April 2018	Monthly meeting	<ul style="list-style-type: none"> Agreement to be notified when the Southern Flank Validation Notice public consultation period begins. DWER may provide comment during this period. 	
	29 May 2018	Email	<ul style="list-style-type: none"> No comments at this time 	BHP will engage with the Department regarding proposed Offsets
Department of Biodiversity, Conservation and Attractions	27 March 2018	Meeting	<ul style="list-style-type: none"> Validation Notice requirements. Overview of Southern Flank. Management and PMO for the Pilbara olive python, Pilbara leaf- 	Further review of all Assurance Plan PMOs and Offsets Plan.

¹⁸ Meeting held twice a year with the representative body

Stakeholder	Date	Description	Topics Discussed	BHP Response
(DBCA)			<p>nosed bat, northern quoll, and ghost bat.</p> <ul style="list-style-type: none"> • Further review of the Program Outcomes recommended. • Further engagement regarding the Validation Notice can be requested by DoEE or DWER for specialist technical advice as required. • BHP to notify DBCA when the public consultation period begins. 	
	24 April 2018	Meeting	<ul style="list-style-type: none"> • Southern Flank Validation Notice Potential Offset Projects. 	BHP reviewing offsets project for Mining Area C Southern Flank.
	9 May 2018	Meeting	<ul style="list-style-type: none"> • Southern Flank Validation Notice Potential Offset Projects. 	BHP developing offsets project for Mining Area C Southern Flank.
Department of Mines, Industry Regulation and Safety (DMIRS)	30 May 2018	Email	<ul style="list-style-type: none"> • No comments provided at this time 	BHP will engage with the Department regarding proposed Offsets

4 Applicable Program Matters

4.1 Review of Contemporary Data and Information

Twenty-three vertebrate fauna surveys were undertaken wholly or partially in Mining Area C between 1997 and 2018; key surveys are shown in Appendix 2. These surveys involved habitat assessments, systematic vertebrate fauna sampling, motion detection cameras and targeted searches within habitats evaluated as suitable for conservation significant threatened fauna. Dedicated targeted surveys for the ghost bat, northern quoll and Pilbara olive python were undertaken in a manner consistent with the State and Commonwealth survey guidance at the time. The most recent Commonwealth guidance considered included:

- Commonwealth of Australia 2013 Matters of National Environmental Significance Significant Impact Guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*;
- Commonwealth of Australia 2017 EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species;
- Commonwealth of Australia 2016 EPBC Act referral guideline for the endangered northern quoll;
- Commonwealth of Australia 2011 Survey guidelines for Australia's threatened mammals;
- Commonwealth of Australia 2010 Survey guidelines for Australia's threatened bats; and
- Commonwealth of Australia 2011 Survey guidelines for Australia's threatened reptiles.

4.2 Greater Bilby

4.2.1 General Species Information

The greater bilby was common throughout most of its range until the early 1900s when there was a sudden and widespread collapse (Abbott 2001; Johnson 2008). This collapse and range contraction has been attributed to predation from cats and foxes, habitat destruction from introduced herbivores and changed fire regimes. Feral cats have been linked to the reduced success of reintroduced populations (Pavey 2006b).

Within the Pilbara bioregion, the greater bilby exists along the Fortescue River and northeast to Shay Gap (Pavey 2006a). The extent of occurrence for the greater bilby is thought to have remained relatively stable over the last 20 years. Across its current distribution, the greater bilby occupies a variety of habitats that include Mitchell grass and stony downs country of cracking clays, the desert sandplains and dune fields sometimes containing laterite, with hummock grassland (spinifex) and massive red earths with Acacia shrubland (Southgate 1990; Southgate et al. 2007; Johnson 2008; Greatwich 2013). The presence of the greater bilby is strongly associated with substrate type as it is generally restricted to areas that contain suitable burrowing habitat, such as sandy loam plains, alluvial creeks, dunes and sand ridges (TSSC 2016a).

The greater bilby shows a strong association with areas of higher rainfall and temperatures, which may be due to higher plant and food production; and these areas also coincide with areas less tolerated by feral predators, such as the fox (TSSC 2016a).

4.2.2 Baseline Modelling Data

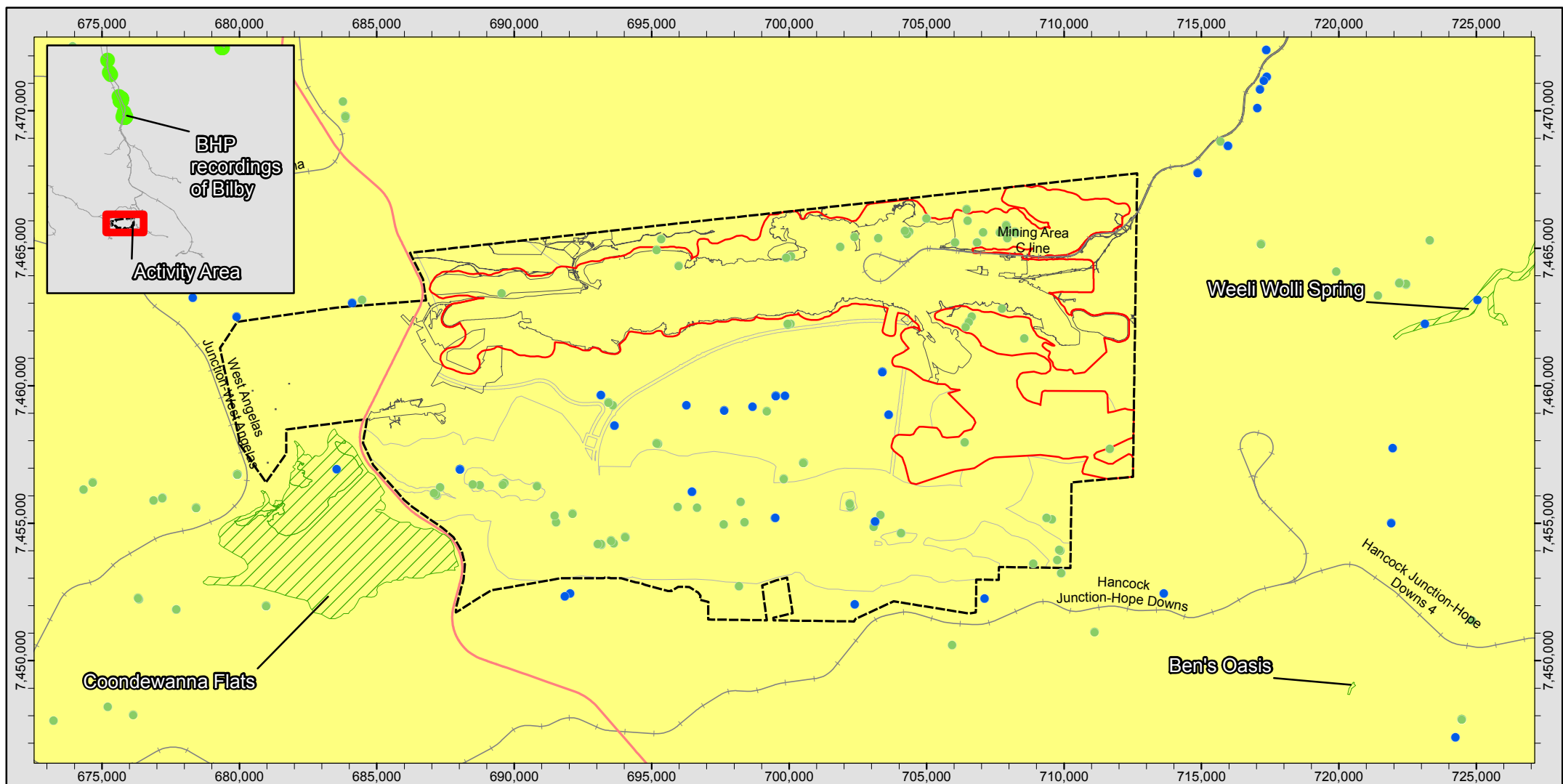
The most preferred greater bilby habitat (Habitat Rank 4) is situated in the northern sections of the Pilbara region (Figure 4.1). The Strategic Assessment Area intersects these preferred habitat areas where the existing rail corridor is located.

Eco Logical (2015b) modelled the habitat preference (the probability of that species being located in certain habitats) for the greater bilby using 21 species records from publicly available and BHP data. The model indicated that preferred habitat (representing the highest probability of potential habitat, Habitat Rank 4) was strongly associated with hotter regions in the eastern part of the Strategic Assessment Area. Within this range, lower, less rocky areas were identified as higher potential greater bilby habitat.

Potential impacts to the greater bilby as a result of the Full Conceptual Development Scenario are considered minor at the regional scale given that less than 1 % (114 ha) of the most preferred habitat (Habitat Rank 4) will be potentially impacted by the Program (Table 4.1). The majority of the habitat occurring within the mining footprint associated with the Full Development Scenario is Habitat Rank 1 the lowest probability of potential habitat) for the greater bilby.

4.2.3 Revised Data and Information for this Notice

Sand plains provide potential habitat for the greater bilby in Western Australia. The greater bilby have also been recorded from mulga woodlands and stony plain habitats. Surveys identified approximately 1,246 ha of potentially suitable sand plain habitat within the activity area (Biologic 2017) (Figure 4.2). 1,282 ha of mulga woodland and 2,516 ha of stony plain occur within the activity area, though these areas were not identified as suitable habitat for the greater bilby during the surveys. Greater Bilby have historically been recorded from these habitat types. Extensive surveys indicate this species is not in the area, with no evidence of presence of the species or individuals recorded. The activity area is within the species' range and the absence of the species could be due to other factors.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Greater Bilby Modelled Habitat
and Regional Records

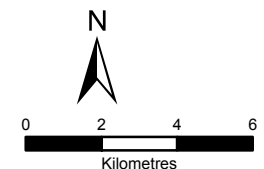
Scale @ A4: 1:200,000	Prepared: P.GANT	Project No: A780/138 REV A
Date: 8/06/2018	Checked: M.LYTTLE	Figure: 4.1
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Greater Bilby
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- Mining Area / Southern Flank Activity Area
- Mining Area C Expansion
- Mining Area C Exemption
- Southern Flank

SEA Federal Greater Bilby Potential for Preferred Habitat Modelling

- 1 - Lowest Potential Habitat Value
- 2
- 3
- 4 - Highest Potential Habitat Value

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Table 4.1: Greater Bilby Habitat Assessment

Modelled Habitat Assessment					Survey Habitat Assessment		
Habitat Description	Modelled Habitat Area Pilbara bioregion	Modelled Habitat in Strategic Assessment Area	Modelled Habitat within the Full Development Scenario	Modelled within Activity Area [^]	Habitat Description	Within the Activity Area	Within disturbance footprint of the Activity
H4	1,751,623	346,501	114	0	Sandplain	1,246ha	236ha
H3	1,513,018	317,289	2,709	0	Mulga Woodland	1,282 ha	637 ha
H2	877,696	134,086	4,659	0	Stony Plain	2,516 ha	982 ha
H1	13,650,278	5,160,202	1,835	32,130			

[^] excluding the Mining Area C existing operations

4.2.4 Impact Assessment

Removal and Fragmentation of Habitat from Land Clearing

The key impact to the greater bilby arising from implementation of the activity is loss of potential habitat. Suitable habitat for greater bilby within the activity area is sand plain, stony plain and mulga woodland habitats (Figure 4.2 and Table 4.1). The 1,246 ha of sand plain represents an isolated area of potentially suitable habitat for the species. Stony plain (2,516 ha) and mulga woodland (1,282 ha) habitats occur within the activity area and throughout the central and eastern Pilbara.

Although there is a presence of apparently suitable habitat within the activity area, extensive surveys indicate this species is not currently occupying the area, with no evidence of presence of the species or individuals recorded. The activity area is within the species' range and the absence of the species could be due to other factors. Survey effort to date includes 13,355 Elliot trap nights, 4,739 cage trap nights, 1,217 camera trap nights, plus extensive diurnal and nocturnal targeted searches over a period of almost 20 years.

The activity will require removal of approximately 1,855 ha of suitable habitat from direct disturbance. Currently there is no evidence of any individuals or populations of greater bilby within the activity area. The risk of impact to the greater bilby from the activity is considered negligible. The activity will meet the Program Matter Objectives and Outcome for greater bilby.

Predation and Competition from Feral Predators

The occurrence of feral predators, in particular the fox, was previously considered the main threatening process to the greater bilby as it caused a significant decline in greater bilby populations across southwestern Australia (DotE 2014b). There is also strong evidence that competition with rabbits for food resources (and potentially burrow resources) is a major threatening process to the greater bilby, with greater bilby distribution correlating to areas where rabbits are now absent or in low abundance (SKM 2012). As there is no greater bilby population within the activity area, the risk of predation of greater bilby is negligible. The activity will meet the Program Matter Objectives and Outcome for greater bilby.

Vehicle Collisions

Haul roads and railways may be a cause of greater bilby mortality at a local scale due to the combination of vehicles operating throughout the night (when the greater bilby is most active) and in locations where roads or rail lines are adjacent to suitable greater bilby habitat.

Haul roads and access roads will be required to support the activity. Currently there is no evidence of any individuals or populations of greater bilby within the activity area. The activity will meet the Program Matter Objectives and Outcome for greater bilby.

4.2.5 Mitigation and Monitoring

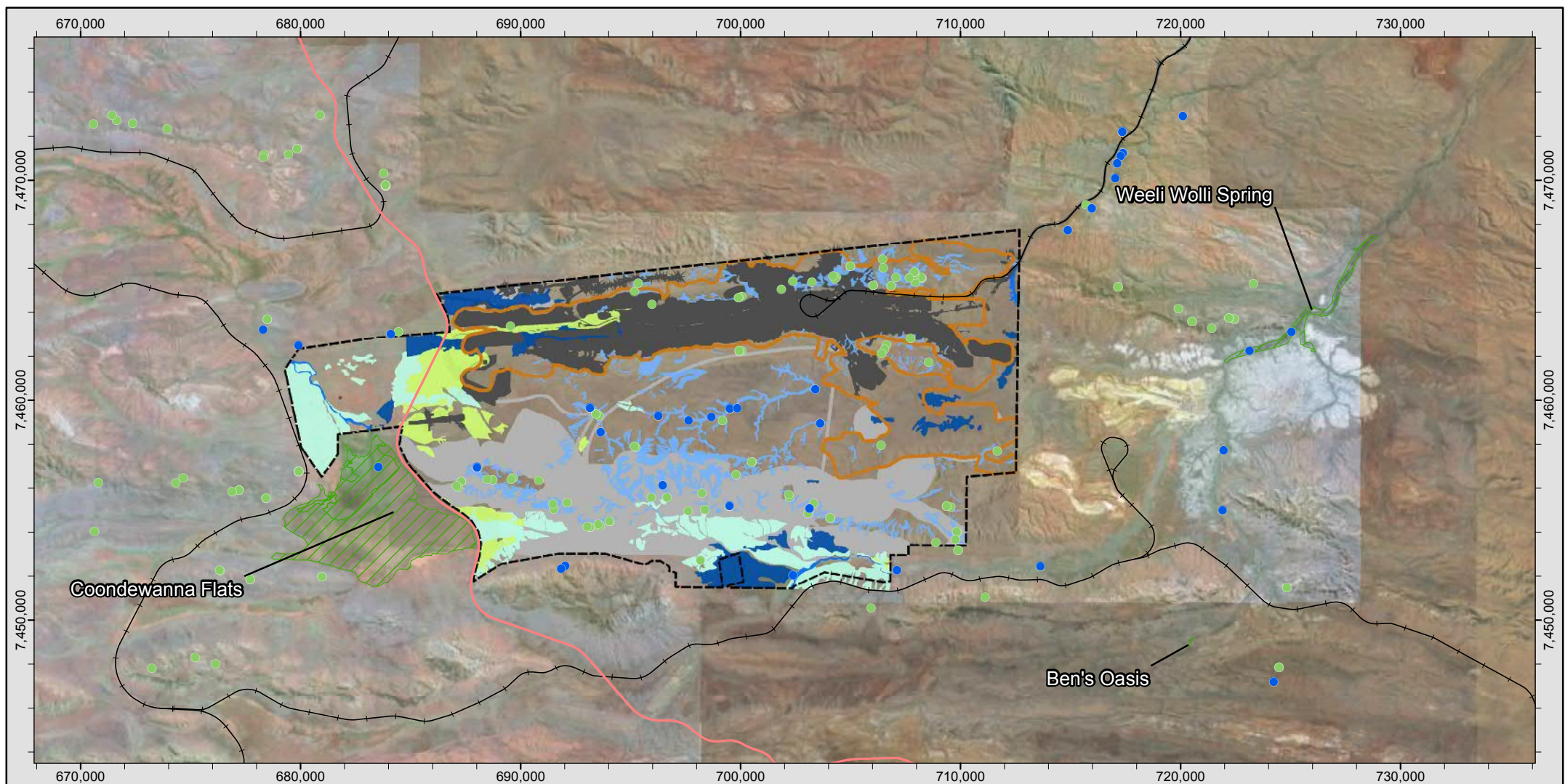
The primary potential impact to the greater bilby from the activity is loss of suitable habitat. The management measures proposed to avoid or minimise this impact include:

Minimise

- Minimise impacts to greater bilby habitat, by avoiding direct impacts where practicable through planning and implementing the Project Environmental and Aboriginal Heritage Review (PEAHR)¹⁹ internal process prior to land disturbance; and
- Minimise clearing of native vegetation, by utilising existing infrastructure, facilities and cleared areas, and disposing of waste rock within mine pits, where practicable.

Table 4.2 outlines the monitoring of the mitigation measures to be implemented.

¹⁹ The PEAHR system manages the implementation of environmental, Aboriginal heritage, land tenure and legal commitments prior to and during land disturbance. All ground disturbance activities will meet the requirements of the PEAHR. All personnel carrying out works associated with clearing activities are required to comply with the Sustainable Development Policy, environmental approvals, the PEAHR requirements and conditions and any other relevant legislative and licensing requirements.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Greater Bilby Mapped Habitat and Regional Records

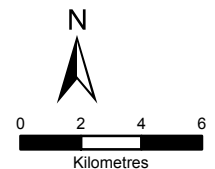
Scale @ A4: 1:250,000	Prepared: P. GANT	Project No: A780/137 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure : 4.2
Revision: Final	Reviewed: K. FLOWERDEW	

- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- Mining Area / Southern Flank Activity Area
- Mining Area C Expansion
- Southern Flank
- Mining Area C Exemption

BHP Fauna Habitat Mapping

- Sand Plain
- Stony Plain
- Gorge/ Gully
- Major Drainage Line
- Mulga Woodland

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Table 4.2: Greater Bilby Assessment, Mitigation and Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Greater Bilby within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none">• Presence of Greater Bilby habitat²⁰ within or adjacent²¹ to the activity; or• Presence²² of Greater Bilby individuals within or adjacent to the activity; or• A recorded Greater Bilby population or habitat within or adjacent to the activity; or• A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Greater Bilby²³.									
Program Matter Outcome	<ul style="list-style-type: none">• No loss of Greater Bilby population/s as a result of Program activities.• Loss of Greater Bilby habitat is offset²⁴ by measures that maintain or enhance the distribution and conservation status of the Greater Bilby.									
Review	Key Impact	Mitigation Hierarchy	Monitoring	Parameters	Performance Targets	Management Response	Location/s	Timing	Guideline	Validation
Baseline Modelled Data No modelled high quality (H4) greater bilby habitat occurs within the activity area (Figure 4.1 and Table 4.1). Regional Records Species recorded 75 km to the north of the activity area. Activity Area Revised Data and Information There is suitable habitat present in the form of sand plain (1,246 ha), mulga woodland (1,282 ha) and stony plain (2,516 ha) habitat in the activity area. While local survey identified habitat that displays the physical attributes of suitable habitat for the greater bilby the surveys did not find any evidence of the species or record individuals.	Direct Impacts <i>Habitat loss</i> The activity requires disturbance of up to: 236 ha of sand plain habitat; 637 ha of mulga woodland; and 982 ha of stony plain habitat.	Minimise Minimise impacts to greater bilby habitat, by avoiding direct impacts where practicable through planning and implementing the PEHR internal process prior to land disturbance. Minimise clearing of native vegetation, by utilising existing infrastructure, facilities and cleared areas, and disposing of waste rock within mine pits, where practicable.	Land disturbance reconciliation. Annual monitoring of the extent and location of land disturbance activities.	Disturbance to greater bilby habitat.	No unauthorised disturbance beyond the activity area.	Response actions to performance targets may include: <ul style="list-style-type: none">• Remediation of habitat;• Construction/relocation (as appropriate) of, or alteration to, artificial greater bilby habitat.	Aerial photography undertaken for the activity area.	Quarterly review and annual reporting.	BHP Offsets Plan - Land reconciliation process.	Objective The activity is unlikely to impact the long-term persistence and viability of the greater bilby within the Strategic Assessment Area. The activity can meet the greater bilby objective Outcome There is no evidence of any individuals or populations of greater bilby within the activity area. Implementation of the activity can meet the Program Matter Outcome for greater bilby.
			Population Monitoring 10 yearly monitoring of greater bilby.	Presence/absence of greater bilby.	Presence of species consistent with baseline data.		Activity area.	10 yearly.	Commonwealth of Australia 2011 Survey guidelines for Australia's threatened mammals (and its revisions). BHP Biodiversity Environmental Management Plan (and its revisions).	

²⁰ Determined by baseline survey. Habitat as defined in the National Recovery Plan for the Greater Bilby.

²¹ For the purpose of the Greater Bilby, *adjacent to* means within 1 kilometre from the activity.

²² Presence is detected with evidence of greater bilby scat, digging, track, etc

²³ Circumstances may include site specific matters related to potential indirect impacts identified in Section 3.3 of this Plan

²⁴ In accordance with Section 3.2 of the Program and the Offsets Plan

4.3 Pilbara Olive Python

4.3.1 General Species Information

The Pilbara olive python is described by DotE (2014c) as being restricted to ranges within the Pilbara bioregion, although an isolated population is thought to occur south on Mount Augustus in the Gascoyne region (Bush & Maryan 2011), and additional records exist in the north-eastern Carnarvon region. Within the Pilbara bioregion, the species has been recorded from the Hamersley Range, Dampier Archipelago, Pannawonica, Millstream, Tom Price, Burrup Peninsula, and 70 km east of Port Hedland (DotE 2014c). The species is also known from riparian areas along the Fortescue River (Doughty et al. 2011).

Pilbara olive pythons are known to occupy a distinct home range ranging from 85 to 450 ha and to move around frequently within their home range (Pearson 2003).

4.3.2 Baseline Modelling Data

In the Impact Assessment Report, Eco Logical (2015a) modelled the habitat preference for the Pilbara olive python using 75 species records from publicly available and BHP data. The model indicated that preferred habitat (Habitat Rank 4) was most heavily concentrated in the ranges of the southern and central areas of the Pilbara bioregion; however, preferred habitat was also predicted in association with river plains in the north and the ranges and outcrops of the eastern part of the Pilbara bioregion.

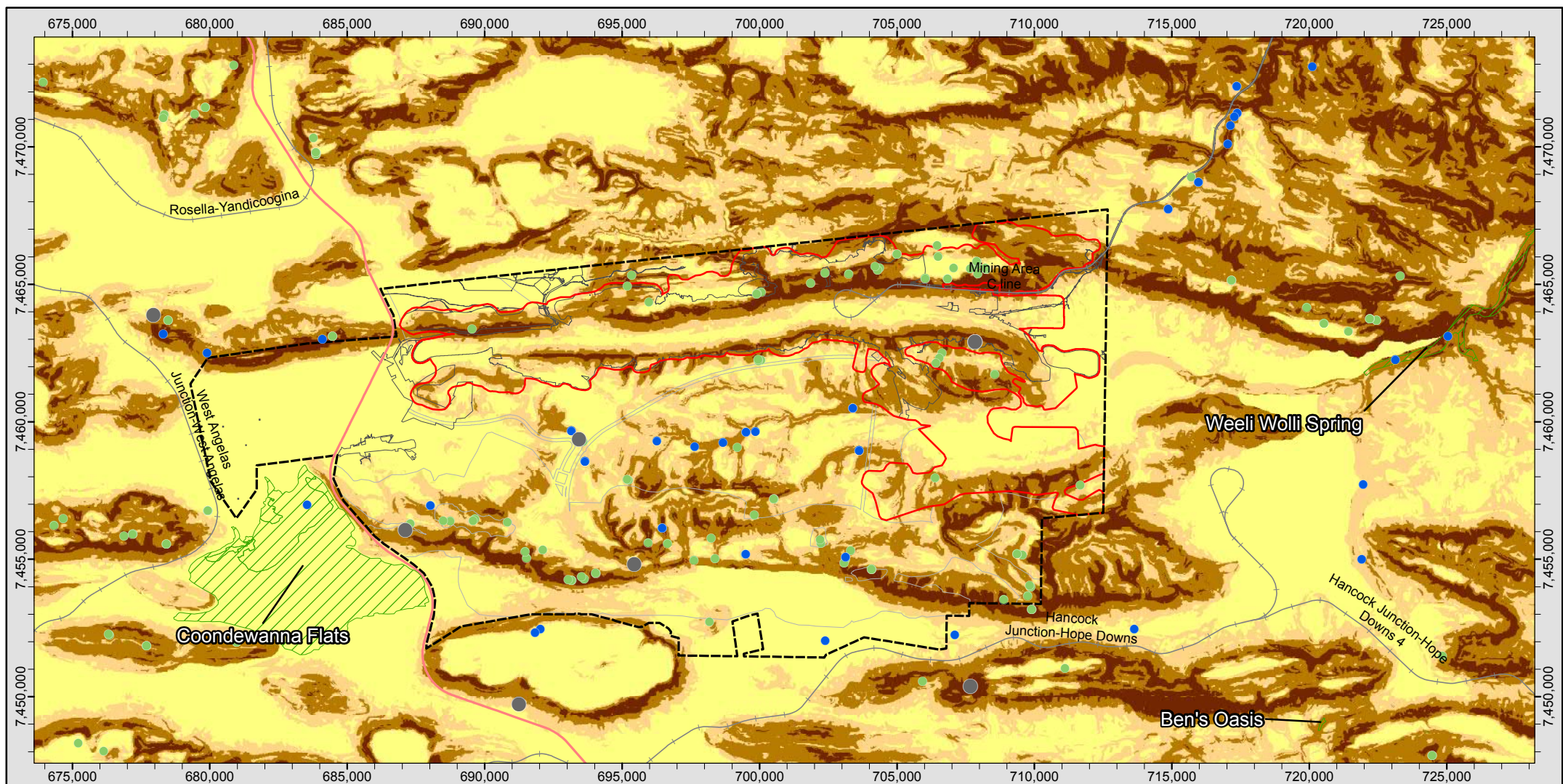
The cumulative impact assessment model predicted a potential decrease of 1,344 ha to Habitat Rank 4 for the Pilbara olive python as a result of the Full Conceptual Development Scenario. This area of potential impact from the Program represents less than 1% of the area modelled as Habitat Rank 4 within the Pilbara bioregion.

In addition to the regional modelling approach, BHP also conducted an impact assessment based on Pilbara olive python species records. The records data were obtained from the State Department of Parks and Wildlife and Western Australian Museum in December 2015 and January 2016 respectively. Based on the species records data, 22% of the known records within the Strategic Assessment Area are predicted to be impacted cumulatively by iron ore mining in the Pilbara. The data shows that the majority of the impact is from BHP. The python is a cryptic species that is difficult to specifically target during fauna surveys (TSSC 2008), so this number is unlikely to represent its abundance and distribution within the Pilbara. There is currently no population estimate for the Pilbara olive python although it is believed to have sizable populations in areas (e.g. the Burrup Peninsula), and some of these are restricted from threatening processes (Pearson 2003).

The baseline modelling data concluded that the cumulative impact to this species was considered to be moderate. Figure 4.3 and Table 4.3 shows the Pilbara olive python modelled habitat and regional records within the activity area.

4.3.3 Revised Data and Information for this Notice

There have been three records of the Pilbara olive python within the activity area. Records include a single confirmed record (a dead individual), as well as probable scats from two locations. There is suitable habitat present in the form of gorge/gully habitat throughout much of the activity area, and 14 surface water pools have been identified by BHP and during baseline and targeted surveys (Figure 4.4 and Table 4.3). While there is potential habitat for this species in the activity area and surrounding areas, there are relatively few records from this region of the Hamersley Range (Figure 4.4). This may reflect the difficulties in recording this species rather than the scarcity of pythons.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Pilbara Olive Python Modelled Habitat and Regional Records

Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/132 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.3
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Pilbara Olive Python
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- ▭ Mining Area / Southern Flank Activity Area
- ▭ Mining Area C Expansion
- ▭ Mining Area C Exemption
- ▭ Southern Flank

Pilbara Olive Python Potential for Preferred Habitat Modelling

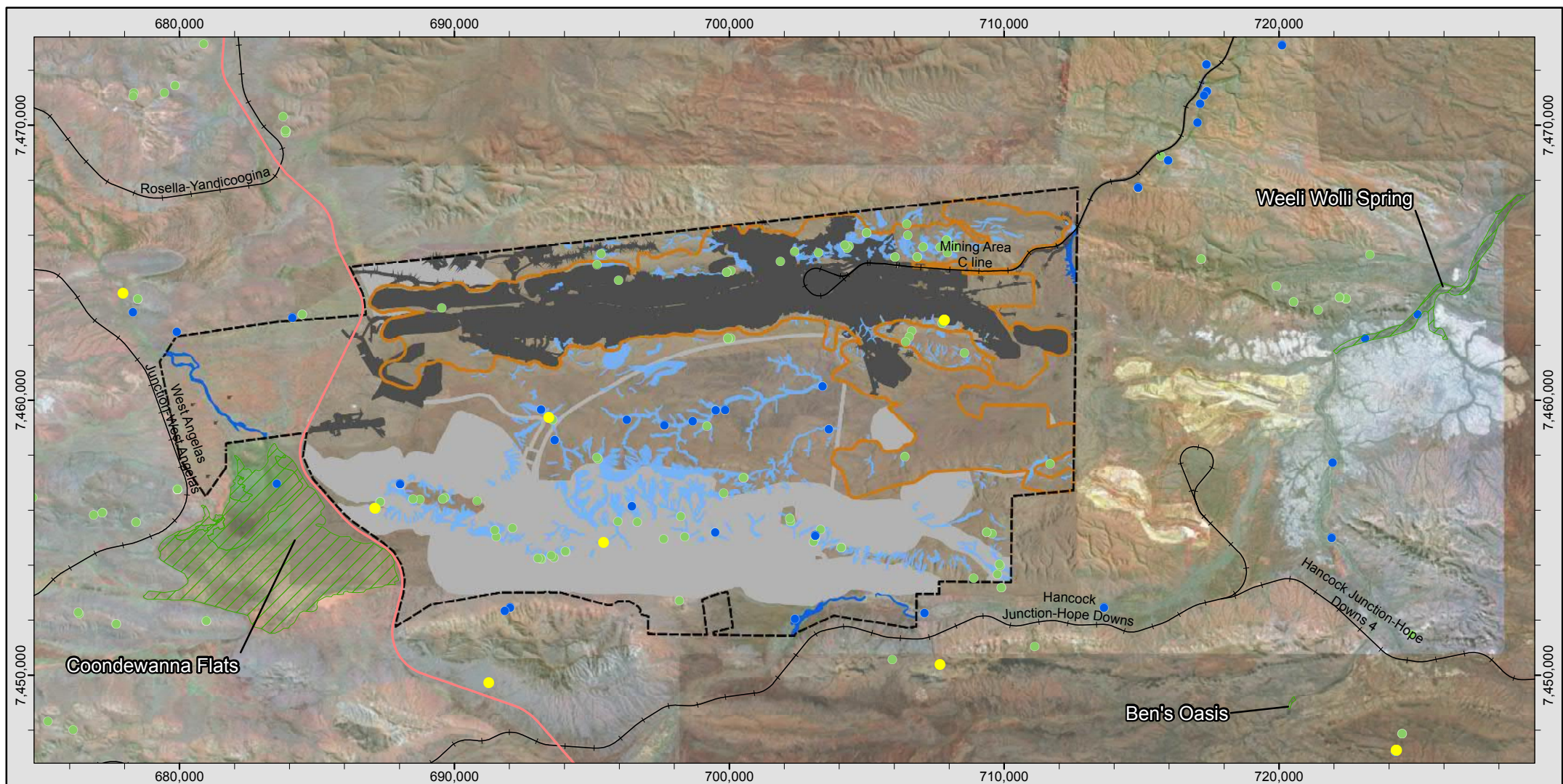
- 1 - Lowest Potential Habitat Value
- 2
- 3
- 4 - Highest Potential Habitat Value

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0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Pilbara Olive Python Mapped Habitat
and Regional Records

Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/133 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.4
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Pilbara Olive Python
- Cave
- Waterhole
- Existing Rail
- Great Northern Highway
- ▨ PECBoundaries

- ▭ Mining Area / Southern Flank Activity Area
- ▭ Mining Area C Expansion
- ▭ Mining Area C Exemption
- ▭ Southern Flank
- BHP Fauna Habitat Mapping**
- ▭ Gorge/ Gully
- ▭ Major Drainage Line

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0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Table 4.3: Pilbara Olive Python Habitat Assessment

Modelled Habitat Assessment (ha)					Survey Habitat Assessment		
Habitat Description	Modelled Habitat Area Pilbara bioregion	Modelled Habitat in Strategic Assessment Area	Modelled Habitat within the Full Development Scenario	Modelled within the Activity Area [^]	Habitat Description	Within the Activity Area	Within disturbance footprint of the Activity
H4	1,126,500	473,336	1,344	2,052	Gorge and Gully	2,105ha	1,123 ha
H3	2,948,403	1,060,548	23,897	7,579			
H2	3,100,368	1,161,035	35,155	8,957	Pools	14	4
H1	10,609,870	3,263,373	60,394	13,543	Major drainage	135 ha	2 ha

[^] excluding the Mining Area C existing operations

4.3.4 Impact Assessment

Habitat Loss

The key impact to the Pilbara olive python arising from implementation of the activity is loss of habitat. Regionally there are potential habitats that support permanent water. These include Weeli Wolli Spring Priority Ecological Community (PEC), Ben's Oasis, Coondiner Pool, Koodaideri Spring and Punda Spring. Weeli Wolli Spring PEC; and Ben's Oasis, a component of the Weeli Wolli PEC, are located approximately 10 km east and 12 km southeast respectively from the boundary of the activity area. No direct impacts to Weeli Wolli Spring and Ben's Oasis are expected from the activity. Indirect impacts to these habitat areas may occur through groundwater drawdown for the activity. Coondiner Pool, Koodaideri Spring and Punda Spring are located approximately 65 km east northeast, 40 km north and 55 km east respectively from the boundary of the activity area. No direct or indirect impacts to these areas are expected from the implementation of the activity.

Within the activity area suitable habitat for this species consists of water pools in rocky gorges and watercourses. A total of 2,105 ha of this habitat has been mapped. Approximately 1,123 ha of gorge/gully habitat will be disturbed by mining activities. The 135 ha of major drainage habitat mapped will remain intact with less than 2 ha to be disturbed. All of these habitats are contiguous with surrounding areas and are not considered to be uncommon in this part of the Hamersley Range. The removal of habitat is unlikely to have a significant impact on the population of Pilbara olive python within the Strategic Assessment Area.

Habitat Modification

Changes in natural surface water flows and quality and potential impacts to groundwater through mining activities may affect the Pilbara olive python via impacts to the species' foraging habitat. In relation to mining activities, pit dewatering and extraction of groundwater may lead to a decline in the water level or to drying of waterholes, thereby leading to a loss of foraging habitat. The Pilbara olive python may be affected by groundwater drawdown through reduced availability of groundwater-fed surface water and through interception of surface runoff and a reduced catchment area directing runoff to water bodies.

Surface Water

Ground disturbance activities, such as the creation of pits, OSAs and other infrastructure, will occur within the Weeli Wolli Creek sub-catchments and reduce the size of the catchment. The disturbance will result in approximately a 3.5% reduction of the Weeli Wolli Creek sub-catchments (MWH 2016). The surface water flow would decrease ~0.8% in the Weeli Wolli Spring sub-catchment. The impacts to the hydrological regime are within regional and seasonal variations in the catchment.

Surveys have identified several surface water pools in the activity area (Figure 4.4). The pools have water for variable durations associated with rain events and are not considered permanent. The pools are likely to provide habitat for the Pilbara olive python, although there are no records of pythons from these locations. Direct impacts to four of the pools is expected from the activity. The mining activities will remove parts of the upper catchment of several of the pools. This is likely to result in indirect impacts to the pools through decreased flows. The water quality of the pools may be impacted through increased sediment load in the surface water flow. The impact to the Pilbara olive python is expected to be minor. Implementation of BHP standard practices for surface water management shall minimise water quality impacts to downstream receptors. The activity will meet the Program Matter Objectives and Outcome for the Pilbara olive python.

Groundwater

Ground water abstraction and mine dewatering is required by the activity to allow mining to occur. Minor changes to the hydrological regime in Weeli Wolli Spring PEC (including Ben's Oasis) are expected as a result of the implementation of the activity. Given the proximity of Coondiner Pool, Koodaideri Spring and Punda Spring from the boundary of the activity area, no direct or indirect impacts to these areas are expected from the implementation of the activity.

Within the activity area, groundwater abstraction may indirectly alter the duration of the pools that form potentially suitable habitat for the Pilbara olive python. These habitat features are found throughout the Hamersley Ranges and are not restricted to the activity area. Groundwater abstraction for the activity will have a negligible impact to the populations of the Pilbara olive python. The activity will meet the Program Matter Objectives and Outcome for the Pilbara olive python.

4.3.5 Mitigation and Monitoring

The primary impact to the Pilbara olive python from the activity is loss of potentially suitable habitat and changes to hydrological regimes. The management measures proposed to avoid or minimise this impact include;

Avoid

- Avoid direct impacts to Weeli Wolli Spring, Ben's Oasis, Coondiner Pool, Koodaideri Spring and Punda Spring.

Minimise

- Minimise impacts to Pilbara olive python habitat (eg pools) by avoiding direct impacts where practicable through planning and implementing the PEHR internal process prior to land disturbance.
- Minimise clearing of native vegetation and land disturbance, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable.
- Surface water will be diverted around the mining footprint to the extent practicable to minimise the loss of surface water flow in the natural drainage systems.
- Minimise groundwater abstraction by utilising dewatering as the water supply for the activity.

Table 4.4 outlines the targets and monitoring to be implemented for the activity.

Table 4.4: Pilbara Olive Python Assessment, Mitigation and Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Pilbara olive python within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none"> • Presence of Pilbara olive python habitat²⁵ within or adjacent²⁶ to the activity; or • Presence²⁷ of Pilbara olive python individuals within or adjacent to the activity; or • A recorded Pilbara olive python individual or habitat within or adjacent to the activity; or • A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Pilbara olive python. 									
Program Matter Outcome	<ul style="list-style-type: none"> • No loss of Pilbara olive python population/s as a result of Program activities. • Program activities do not physically disturb, or result in adverse changes to the hydrological regimes and/or water quality of the following waterholes: Weeli Wolli Spring, Coondiner Pool, Ben's Oasis, Koodaideri Spring, and Punda Spring. • Loss of Pilbara olive python habitat is offset²⁸ by measures that maintain or enhance the distribution and conservation status of the Pilbara olive python. 									
Review	Impact assessment	Management Actions	Monitoring	Parameters	Performance Targets	Management Response	Location/s	Timing	Guideline	Validation
<p>Baseline Modelling Data</p> <p>The model indicated that preferred habitat (Habitat Rank 4) was most heavily concentrated in the ranges of the southern and central areas of the Pilbara bioregion. Approximately 2,052ha of H4 within the activity area.</p> <p>Regional Records</p> <p>Sixteen (16) records of the species occur in the region. One record 8 km west, one record 10 km south, one record 1 km southeast, one record 15 km southeast, three records at BHP's Jinidi project area (20 km east), six records at BHP's Yandi operations (15 to 20 km north), three records along Weeli Wolli Creek (20 km east).</p> <p>Activity Area Revised Data and Information</p> <p>There is suitable habitat present in the form of gorge/gully habitat throughout the activity area. Approximately 2,105 ha of gorge/gully identified</p> <p>Several surface water pools identified within the activity area.</p> <p>Records from within the activity area include a single confirmed record (a dead</p>	<p>Direct Impacts</p> <p><i>Habitat Removal</i></p> <p>Removal of up to 1,123 ha of gorge and gully habitat for the activity.</p>	<p>Avoid</p> <p>Avoid direct impacts to known permanent pools in the region of the activity area</p> <p>Minimise</p> <p>Minimise impacts to Pilbara olive python habitat (pools and gorges/gullies), by avoiding direct impacts where practicable through planning and implementing PEHR internal process prior to land disturbance.</p> <p>Minimise clearing of native vegetation, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable.</p> <p>Surface water will be diverted around the mining footprint to the extent practicable to minimise the loss of surface water flow in the natural drainage systems.</p> <p>Minimise groundwater abstraction by dewatering</p>	<p>Population Monitoring</p> <p>5 yearly target surveys</p>	<p>Presence/absence of Pilbara olive python.</p>	<p>Presence of species consistent with baseline data.</p>	<p>Response actions to performance targets may include:</p> <ul style="list-style-type: none"> • Remediation of habitat. • Construction/relocation (as appropriate) of, or alteration to, artificial greater bilby habitat. 	<p>Program activity area.</p>	<p>5 yearly.</p>	<p>Commonwealth of Australia 2011 Survey guidelines for Australia's threatened reptiles (and its revisions).</p> <p>BHP Biodiversity Environmental Management Plan (and its revisions).</p>	<p>Objective</p> <p>The activity is unlikely to impact to the long-term persistence and viability of the Pilbara olive python within the Strategic Assessment Area. The activity can meet the Pilbara olive python objective.</p>
	<p>Indirect Impacts</p> <p><i>Hydrology</i></p> <p>The surface water flow and quality to one of the pools may be indirectly impacted, as a result of disturbance to the upper catchment.</p> <p>Groundwater abstraction may result in a change to hydrological regimes of regional surface water pools.</p>		<p>Land disturbance reconciliation.</p> <p>Annual monitoring of the extent and location of land disturbance activities d disturbance reconciliation</p>	<p>Land disturbance of pools</p> <p>Disturbance of Pilbara olive python habitat.</p>	<p>No unauthorised disturbance beyond the activity area.</p>		<p>Aerial photography undertaken for the activity area.</p>	<p>Quarterly review and annual reporting.</p>	<p>BHP Offsets Plan - Land reconciliation process.</p>	
			<p>Hydrological Monitoring:</p> <p>Groundwater level monitoring</p> <p>Baseline groundwater</p>	<p>Groundwater levels.</p>	<p>Monitoring commenced 2 years prior to commencement of dewatering of the eastern deposits.</p>	<p>Response actions to performance targets may include:</p> <ul style="list-style-type: none"> • Pathway and receptor monitoring network established; • Mitigation and aquifer recovery approach developed in consideration of 	<p>Bores located at:</p> <p>R Deposit;</p> <p>Southern Flank eastern deposits;</p> <p>Southern Flank dolomites; and</p>	<p>Quarterly review and annual reporting.</p>	<p>BHP Central Pilbara Water Resource Management Plan (and its revisions).</p>	<p>No direct disturbance to Weeli Wolli Spring attributable to activities.</p> <p>No adverse impact to Weeli Wolli Spring and Ben's Oasis as a result of activities.</p>

²⁵ Determined by baseline survey. Habitat as defined in Conservation Advice for the Pilbara olive python.²⁶ For the purpose of the Pilbara olive python, *adjacent to* means (a) within 1.5 kilometres from the activity and (b) to the extent of a modelled groundwater drawdown from implementing the activity.²⁷ Presence is detected with evidence of Pilbara olive python scat, track, etc²⁸ In accordance with Section 3.2 of the Program and the Offsets Plan

individual), as well as probable scats from two locations.		as the water supply for the activity.	level data collection.			current aquifer conditions.	Weeli Wolli Spring and Ben's Oasis (pending appropriate access).			The activity can meet the Program Matter Outcomes for Pilbara olive python.
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4.4 Pilbara Leaf-nosed Bat

4.4.1 General Species Information

The Pilbara leaf-nosed bat occurs over an approximate area of 120 million hectares (Eco Logical 2014c) and is restricted to the Pilbara bioregion of Western Australia. Armstrong (2001) suggests that there may be three discrete subpopulations – George Range, Hamersley Range and Upper Gascoyne – separated by extensive flat areas restricting gene flow. Individual colonies vary in size from 10 individuals to 20,000 individuals, although the latter is exceptional (e.g. Armstrong 2001; Ecologia Environment 2005, 2006a, 2006b). The total number of Pilbara leaf-nosed bats is currently unknown due to difficulties in counting individuals (Eco Logical 2014c). An assessment of data by Bullen (2013) indicates 24 maternal or day roosts occur across the Pilbara.

4.4.2 Baseline Modelling Data

In the Impact Assessment Report, Eco Logical (2015a) modelled the habitat preference for the Pilbara leaf-nosed bat using 137 species records from publicly available and BHP data. The model indicated that preferred habitat (Habitat Rank 4) occurs in the central-east of the Pilbara bioregion.

The cumulative impact assessment model predicted a potential decrease of 6,275ha to Habitat Rank 4 for the Pilbara leaf-nosed bat as a result of the Full Conceptual Development Scenario (Table 4.5). This area of potential impact from the Program represents less than 1% of the area modelled as Habitat Rank 4 within the Pilbara bioregion. BHP recognises that, although the modelled potential impact is considered relatively minor at a regional scale, the Pilbara leaf-nosed bat has specific habitat requirements that may not have been captured at a regional scale, and thus management at a local scale is important.

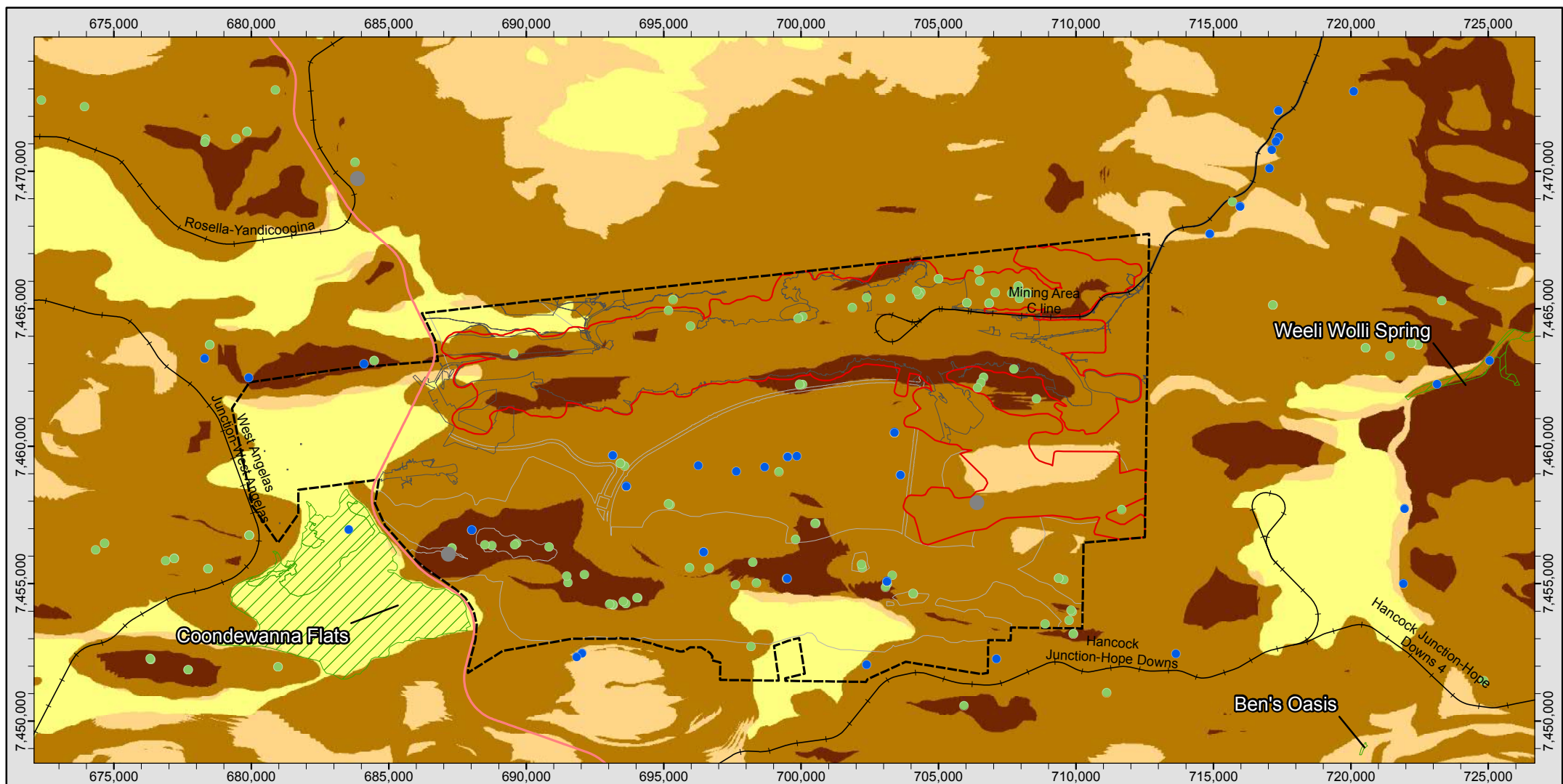
In addition to the regional modelling approach, BHP also conducted an impact assessment based on Pilbara leaf-nosed bat species records. The records data were obtained from the State Department of Parks and Wildlife and Western Australian Museum in December 2015 and January 2016 respectively. Based on the species records data, 7.7% of the known records within the Strategic Assessment Area were predicted to be cumulatively impacted by iron ore mining in the Pilbara. The data show that the potential impact is from both BHP and reasonably foreseeable third party mines.

Based on surveys to date, there have been no significant roosts for this species identified in BHP tenure; therefore this species was considered to be at low risk from the Full Conceptual Development Scenario. Figure 4.5 shows the Pilbara leaf-nosed bat modelled habitat and regional records within the activity area.

Table 4.5: Pilbara Leaf-nosed bat Habitat Assessment

Modelled Habitat Assessment (ha)					Survey Habitat Assessment (ha)		
Habitat Description	Modelled Habitat Area Pilbara bioregion	Modelled Habitat in Strategic Assessment Area	Modelled Habitat within the Full Development Scenario	Modelled within Activity Area	Habitat Description	Within the Activity Area	Within disturbance footprint of the Activity Area
H4	1,623,283	437,819	6,275	3,775	Gorge and Gully	2,105 ha	1,123ha
H3	4,233,754	1,956,461	59,048	23,388			
H2	6,569,572	1,388,978	15,271	1,256	Pools	14	4
H1	5,372,377	2,174,864	80,595	3,712			

^ excluding the Mining Area C existing operations



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Pilbara Leaf-nosed Bat Modelled Habitat and Regional Records

Scale @ A4: 1:200,000	Prepared: P.GANT	Project No: A780/134 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.5
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Pilbara Leaf-nosed Bat
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- ▨ PEC Boundaries

▨ Mining Area / Southern Flank Activity Area

- ▨ Mining Area C Expansion
- ▨ Mining Area C Exemption
- ▨ Southern Flank

Pilbara Leaf-nosed Bat Potential for Preferred Habitat Modelling

- 1 - Lowest Potential Habitat Value
- 2
- 3
- 4 - Highest Potential Habitat Value

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

4.4.3 Revised Data and Information for this Notice

There are two records of Pilbara leaf-nosed bat from two locations in the activity area, despite extensive baseline and targeted surveys for bats in the area and the presence of apparently suitable habitat. Records are from a single call recorded from a cave in the east of the activity area and a record from the west of the activity area (Figure 4.6). The cave location is considered to be a nocturnal refuge roost (Table 4.6), with infrequent low use by the Pilbara leaf-nosed bat. The records were considered to come from single itinerant or dispersing individuals from either the well-documented Koodaideri roost approximately 35 km north or the Kalgan Creek roost approximately 76 km southeast (B. Bullen, Bat Call WA, pers. comm. 2014). With these being the only records from the extensive bat survey effort previously completed in the activity area and surrounding locality, the data strongly suggest there are no critical habitat roost sites (Priority 1 to 3 - Table 4.6). Several pools have been identified within the activity area, though the Pilbara leaf-nosed bat has not been recorded utilising these areas.

Table 4.6: Critical Roosting and Foraging habitat for the Pilbara leaf-nosed bat (TSSC 2016)

Priority	Roost Description	Habitat Description
1	Permanent Diurnal Roosts Occupied year-round and likely the focus for some part of the 9-month breeding cycle; Critical habitat that is essential for the daily survival of the Pilbara leaf-nosed bat.	Gorges with pools Watercourses through upland areas bounded by sheer rock walls for parts of their length, often containing pools that remain for weeks or months, sites of relatively large biomass production, sometimes containing caves;
2	Non-permanent breeding roosts Evidence of usage during some part of the 9-month breeding cycle (July–March), but not occupied year-round; Critical habitat that is essential for both the daily and long-term survival of the Pilbara leaf-nosed bat.	Gullies Primary drainage with limited riparian development in upland rocky habitats, sometimes containing small pools that may last for weeks, with less biomass production than Priority 1 gorge habitat;
3	Transitory diurnal roosts Occupied for part of the year only, outside the breeding season (i.e. April–June), and which could facilitate long distance dispersal in the region; Critical habitat that is essential for both the daily and long-term survival of the Pilbara leaf-nosed bat.	Rocky outcrop Areas of exposed rock at the top of rocky outcrop and mesa hills that contain caves and overhangs, and boulder piles in the granite terrains;
4	Nocturnal refuge Occupied or entered at night for resting, feeding or other purposes, with perching not a requirement. Excludes overhangs. Not considered critical habitat, but are important for persistence in a local area.	Major watercourses Riparian vegetation on flat land plus the main gravelly or sandy channel of the river bed, sometimes containing pools that persist for weeks or months, and generally supporting higher productivity of biomass than the surrounding habitats;
5		Open grassland and woodland Dominated by <i>Triodia</i> , on lowland plains, colluvial slopes and hilltops.

4.4.4 Impact Assessment

Habitat Loss

The primary impact to the Pilbara leaf-nosed bat is the potential loss of roost sites associated with mining activities. The Pilbara leaf-nosed bat has a very limited ability to conserve heat and water and requires very hot (28 to 32°C) and humid (96% to 100%) roost sites in caves or abandoned mines (Armstrong 2001). Such caves are relatively uncommon in the Pilbara (Armstrong and Anstee 2000; Armstrong 2001), which limits the availability of diurnal roosts for this species. Loss of roosting habitat can occur in many ways, such as collapse or flooding of disused mines, as well as mining activities, such as open cutting of underground mines, exploration drilling and blasting.

The activity requires the removal of one nocturnal refuge roost. Nocturnal refuge roosts are not considered critical habitat for the Pilbara leaf nosed bat. Surveys have identified, gorge and gully habitats and several surface water pools in the activity area (Table 4.5). Approximately 1,123 ha of this habitat will be removed by the activity. This habitat is contiguous with surrounding areas and are not considered to be uncommon in this part of the Hamersley Range. The lack of records of the species, suggest that the records may be from a transient or individual dispersing and not a resident population within the activity area. The activity will have a negligible impact on the Pilbara leaf-nosed bat and can meet the Program Matter Outcome for the species.

Habitat Modification

Hydrological change may affect the Pilbara leaf-nosed bat via reduced available surface water, which supports the species' prey (insects) and is a source of drinking water. The occurrence of pools of water is a critical component of the Pilbara leaf-nosed bat's foraging habitat (Armstrong 2001).

Changes to groundwater regimes may also affect the species' roosting habitat if changes to the groundwater table affect the humidity of the roost. Armstrong (2001) suggests the presence of seeps or groundwater pools is the most important factor in determining roost suitability; groundwater is considered important to maintain stable temperature and high humidity regimes of roost caves, and Pilbara leaf-nosed bat roosts are often associated with groundwater seeps (Armstrong 2001; DotE 2016b). The activity will be undertaking dewatering to allow mining to occur. The impacts to the Pilbara leaf-nosed bat from this activity are minor, as there are no roosts within the activity area categorised as critical habitat.

Several surface water pools were identified in the activity area (Figure 4.6). The pools may provide suitable priority 1 habitat for the Pilbara leaf-nosed bat. Direct impacts to four of the pools is expected from the activity. Mining will remove part of the upper catchment of the pools. This may result in indirect impacts to the pools through decreased flows. The water quality of the pools may be impacted through increased sediment load in the surface water flow. Implementation of BHP standard practices for surface water management should minimise water quality impacts to downstream receptors. As there are no records of the Pilbara leaf-nosed bat from the locations of the surface water pools the risk of impact to the species is low.

Light, noise and vibration have the potential to adversely impact Pilbara leaf-nosed bat populations via the disturbance of natural roosts. The roost identified within the activity area is a nocturnal refuge with low recorded use by the Pilbara leaf-nosed bat.

The Program Matter Outcomes for the Pilbara leaf-nosed bat can be met by the activity.

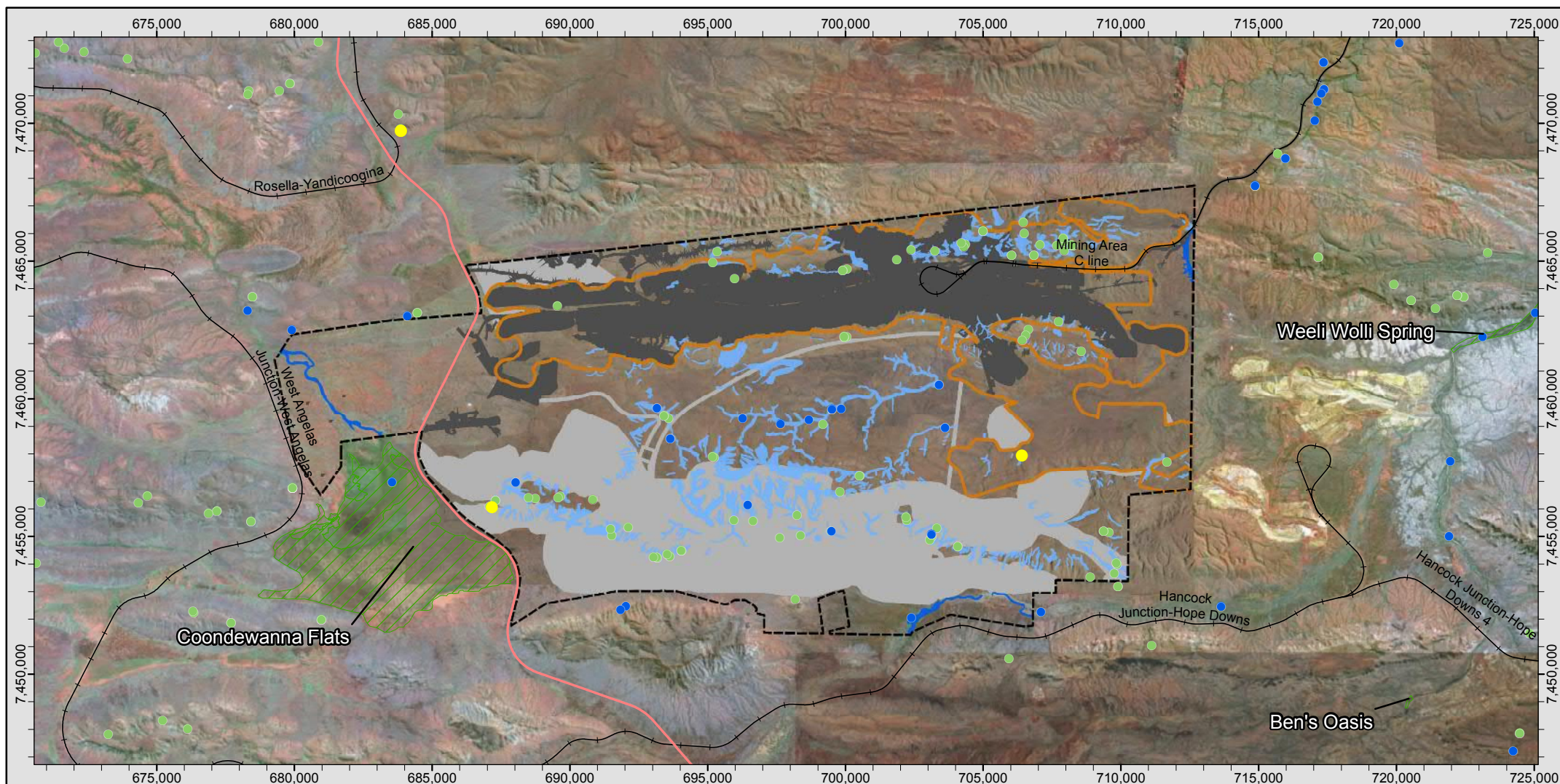
4.4.5 Mitigation and Monitoring

The primary impact to the Pilbara leaf-nosed bat from the activity is loss of potentially suitable habitat. Key management measures proposed to avoid or minimise this impact from the implementation of the activity include:

Minimise

- Minimise impacts to Pilbara leaf-nosed bat critical roosts and foraging habitat, by avoiding direct impacts where practicable through planning and implementing the PEAHR internal process prior to land disturbance; and
- Minimise clearing of native vegetation, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable.

Table 4.7 outlines the targets and monitoring to be implemented for the Southern Flank Program activity.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Pilbara Leaf-nosed Bat Mapped Habitat and Regional Records

Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/135 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure : 4.6
Revision: Final	Reviewed: K. FLOWERDEW	

- Cave
- Waterhole
- BHP recordings of Pilbara Leaf-nosed Bat
- Existing Rail
- Great Northern Highway
- ▨ PECBoundaries

- ▭ Mining Area / Southern Flank Activity Area
- ▭ Mining Area C Expansion
- ▭ Southern Flank
- ▭ Mining Area C Exemption
- BHP Fauna Habitat Mapping**
- ▭ Gorge/ Gully
- ▭ Major Drainage Line

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Table 4.7: Pilbara Leaf-nosed Bat Assessment, Mitigation and Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Pilbara leaf-nosed bat within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none">• Presence of Pilbara leaf-nosed bat roosting or foraging habitat¹ within or adjacent² to the activity; or• Presence³ of Pilbara leaf-nosed bat individuals within or adjacent to the activity; or• A recorded Pilbara leaf-nosed bat population or habitat within or adjacent to the activity; or• A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Pilbara leaf-nosed bat.									
Program Matter Outcomes	<ul style="list-style-type: none">• No loss of Pilbara leaf-nosed bat population/s as a result of Program activities.• Loss of Pilbara leaf-nosed bat habitat is offset⁴ by measures that maintain or enhance the distribution and conservation status of the Pilbara leaf-nosed bat.									
Review	Impact	Management Hierarchy	Monitoring	Parameters	Performance Targets	Management Response	Location/s	Timing	Guideline	Validation
<p>Baseline Modelling Data</p> <p>Within the Strategic Assessment Area, Habitat Rank 4 (H4) was modelled to occur in small pockets throughout the central and western areas, associated with the Hamersley Range and Ophthalmia Range. Approximately 3,776ha of Habitat Rank 4 occur within the activity area (Figure 4.5 and Table 4.5).</p> <p>Regional Records</p> <p>One record 6 km northwest, one record 17 km to the southeast.</p> <p>Nearest roosts considered to be at Koodaideri (35 km north) or Kalgan Creek (76 km southeast).</p> <p>Activity Area Revised Data and Information</p> <p>A single call was recorded from two locations (one located in the west and one cave in the east of the activity area Figure 4.6).</p> <p>The caves identified is categorised as a nocturnal refuge roost (TSSC 2016).</p>	<p>Direct Impacts</p> <p><i>Habitat loss</i></p> <p>There are no known critical habitat roost sites as described in TSSC (2016). Approximately 1,123 ha of gorge and gully habitat will be disturbed by the activity.</p>	<p>Minimise</p> <ul style="list-style-type: none">• Minimise impacts to Pilbara leaf-nosed bat critical roost and foraging habitat, by avoiding direct impacts where practicable through planning and implementing the PEAHR internal process prior to land disturbance.• Minimise clearing of native vegetation, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable.	<p>Land disturbance reconciliation</p> <p>Annual monitoring of the extent and location of land disturbance activities</p>	Disturbance to critical Pilbara leaf-nosed bat habitat.	No unauthorised disturbance beyond the activity area.	<p>Response actions to performance targets may include:</p> <ul style="list-style-type: none">• Remediation of habitat;• Construction/relocation (as appropriate) of, or alteration to, artificial Pilbara leaf-nosed bat habitat.	Aerial photography undertaken for the activity area.	Quarterly review and annual reporting.	BHP Offsets Plan - Land reconciliation process.	<p>Objective</p> <p>The activity is unlikely to impact to the long-term persistence and viability of the Pilbara leaf-nosed bat within the Strategic Assessment Area. The activity can meet the Pilbara leaf-nosed bat objective.</p> <p>Outcomes</p> <p>The low number of records of the species suggest the records are from transient or dispersing individuals. The activity can be implemented to meet the Program Matter Outcome for the Pilbara leaf-nosed bat.</p>
			<p>Population monitoring</p> <p>10 yearly monitoring using acoustic records</p>	Presence/absence of Pilbara leaf-nosed bat.	Presence of species consistent with baseline data.		Activity area.	10 yearly.	Commonwealth of Australia 2010 Survey guidelines for Australia’s threatened bats (and its revisions). BHP Biodiversity Environmental Management Plan (and its revisions).	

¹ Determined by baseline survey. Roosting habitat is defined as Priorities 1-4 in the Conservation Advice

² For the purpose of the PLNB, *adjacent to* (a) means within 10 kilometres from the activity or (b) to the extent of a modelled groundwater drawdown from implementing the activity.

³ Presence is demonstrated with evidence of Pilbara leaf-nosed bat scat, bat survey data etc

⁴ In accordance with Section 3.2 of the Program and the Offsets Plan

4.5 Northern Quoll

4.5.1 General Species Information

The northern quoll is the smallest and most arboreal of the four Australian quoll species (van Dyck & Strahan 2008). The northern quoll has undergone a dramatic range contraction since European settlement, including a 75% reduction in distribution during the 20th century. In the Pilbara, northern quoll distribution is bounded in the north, east and south by the Great Sandy Desert, Gibson Desert and Little Sandy Desert (DotE 2014a).

Northern quolls mostly favour rocky habitats (e.g. escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines and treed creek lines) as denning or shelter habitat, and foraging occurs in the vegetated areas surrounding their dens (Commonwealth of Australia 2016).

The ecology of northern quolls is complex as they use habitats in a variety of ways for denning and foraging, and an individual can use multiple den sites. Northern quolls will den during the day and leave den sites to forage during the night. They are generally considered to be solitary, with females having mutually exclusive denning areas, but can have overlapping foraging areas. Populations fluctuate annually, which is likely to be related to the abundance, dispersion and renewability of food (Oakwood 2002). Both sexes usually change dens every night, with females each using up to 55 dens (Oakwood 2008).

4.5.2 Baseline Modelling Data

In the Impact Assessment Report, Eco Logical (2015a) modelled the habitat preference for the northern quoll using 518 species records from publicly available and BHP data. The model indicated that preferred habitat (Habitat Rank 4) was strongly associated with rugged hills, ranges and outcrops in the north and northeast of the Pilbara bioregion, as opposed to areas in the central and southern areas of the Pilbara bioregion. It was acknowledged, however, that the model may have potentially under predicted in the higher elevation ranges in the southern part of the Strategic Assessment Area (Eco Logical 2014a).

The cumulative impact assessment model predicts a potential impact of 504 ha to Habitat Rank 4 for the northern quoll as a result of the Full Conceptual Development Scenario (Table 4.8). In addition to the regional modelling approach, BHP also conducted an impact assessment based on northern quoll species records. The records data were obtained from the State Department of Parks and Wildlife and Western Australian Museum in December 2015 and January 2016 respectively. Based on the species records data, 4% of the known records within the Strategic Assessment Area are predicted to be impacted cumulatively by iron ore mining in the Pilbara. The data show that the majority of the impact is from BHP. There are few records within the Full Conceptual Development Scenario footprint; therefore at this stage the species was considered to be at low risk from the Program. Figure 4.7 shows the northern quoll modelled habitat and regional records within the activity area for this Notice.

Table 4.8: Northern Quoll Habitat Assessment

Habitat Description	Modelled Habitat Assessment (ha)				Survey Habitat Assessment (ha)		
	Modelled Habitat Area Pilbara bioregion	Modelled Habitat in Strategic Assessment Area	Modelled Habitat within the Full Development Scenario	Modelled within Activity Area	Habitat Description	Within the Activity Area	Within the disturbance footprint Activity
H4	1,552,321	64,228	504	0	Gorge and Gully	2,105 ha	1,123ha
H3	4,497,928	221,103	3,104	0			
H2	3,822,101	678,966	3,104	296			

Habitat Description	Modelled Habitat Assessment (ha)				Survey Habitat Assessment (ha)		
	Modelled Habitat Area Pilbara bioregion	Modelled Habitat in Strategic Assessment Area	Modelled Habitat within the Full Development Scenario	Modelled within Activity Area	Habitat Description	Within the Activity Area	Within the disturbance footprint Activity
H1	7,920,267	4,993,780	273	31,835			

^ excluding the Mining Area C existing operations

4.5.3 Revised Data and Information for this Notice

There are records of northern quolls from two locations within the activity area. Evidence of northern quoll has been confirmed in the activity area from a scat recorded in gorge/gully habitat in the central-western area (Biologic 2011) and from four fresh scats that are considered likely to be of northern quoll in gorge/gully habitat in the southeast (Biota 2012) (Figure 4.8). Biologic (2013) considered that the presence of scats in the area reflected transient use by northern quolls and may represent a dispersing individual or possibly a breeding male. Regional likelihood mapping undertaken by Biota (2012) considered the activity area to occur in an area unlikely to support northern quolls, although suitable habitat for the species (comprising gorge/gully and major drainage line habitats) does occur. Approximately 2,105 ha of suitable gorge/gully habitat for the northern quoll occurs within the activity area.

4.5.4 Impact Assessment

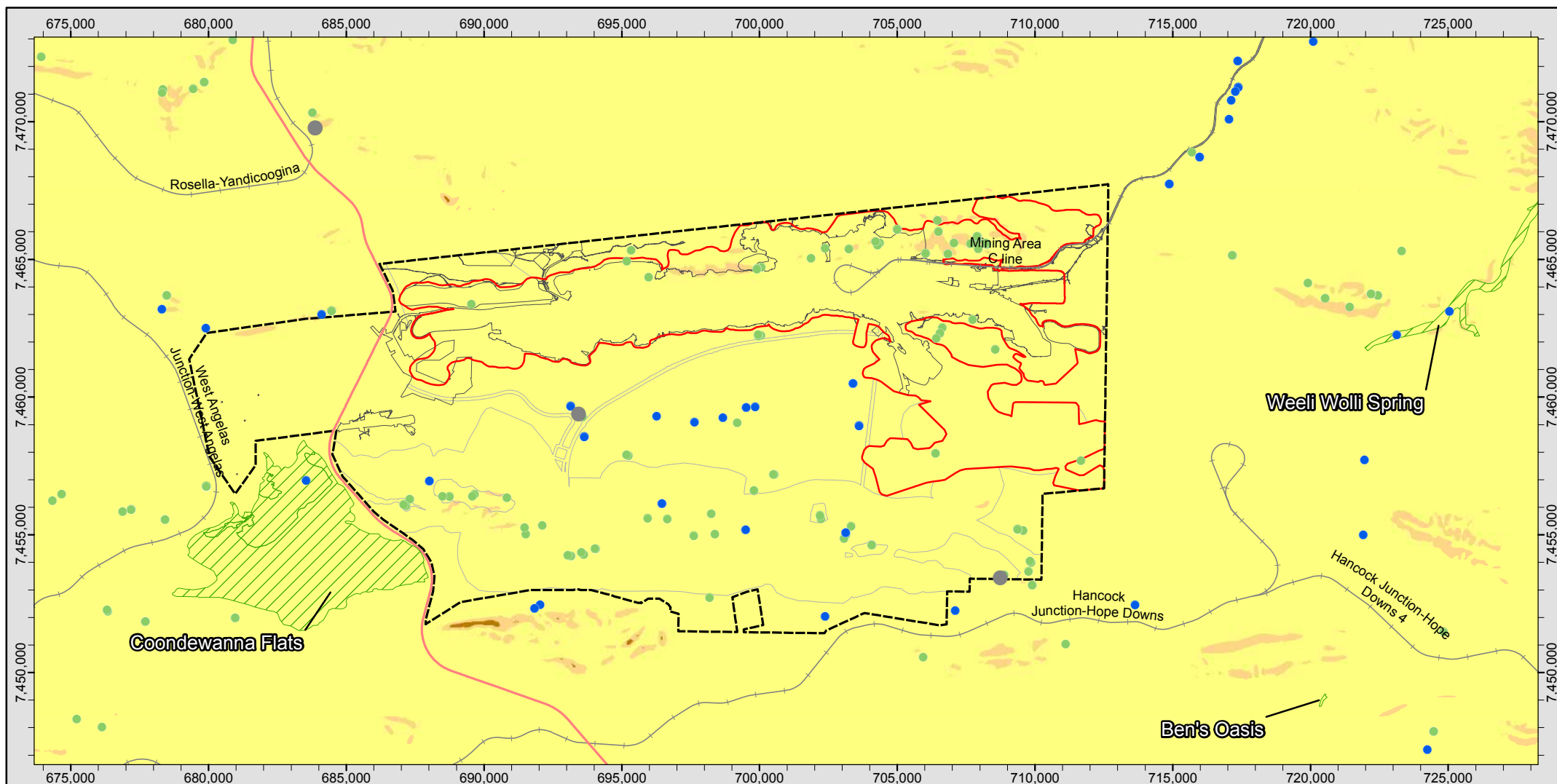
Habitat Loss

Potential impacts to the northern quoll arising from implementation of the activity is loss of suitable habitat. The removal of northern quoll habitat may result in the loss of denning and foraging habitat, consequently causing a reduction in its distribution in the Pilbara bioregion. Suitable habitat for northern quoll within the activity area is the gorge/gully habitat. The surveys identified the gorge/gully habitat throughout the activity area with 2,105 ha of the habitat mapped. Although there is a presence of apparently suitable habitat within the activity area, it is considered that the northern quoll currently occurs at very low density given the lack of species records from the area. The lack of species records are despite the extent of survey work undertaken for this species within the activity area and surrounds. Survey effort to date includes 13,355 Elliot trap nights, 4,739 cage trap nights, 1,217 camera trap nights, plus extensive diurnal and nocturnal targeted searches over a period of almost 20 years.

Habitat fragmentation could isolate northern quoll populations, reduce genetic connectivity across affected areas and increase the risk in reduction of local populations. All of the suitable habitats found within the activity area are contiguous with surrounding areas and are not considered uncommon in this part of the Hamersley Range. The risk of impact to the species from the activity is low. The Program Matter Outcomes for the northern quoll can be met by the activity.

Feral Predators

The season, frequency, extent and severity of fires are all likely to be key factors influencing northern quoll populations. The greatest threat posed by fire, however, is probably the increased risk of predation on northern quolls after removal of cover. When fire has removed the ground cover, northern quolls are more vulnerable to predators, such as dingoes, cats and raptors (Oakwood 2004).



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Northern Quoll Modelled Habitat
and Regional Records

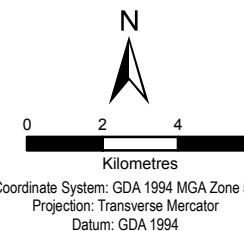
Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/130 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.7
Revision: Final	Reviewed: K. FLOWERDEW	

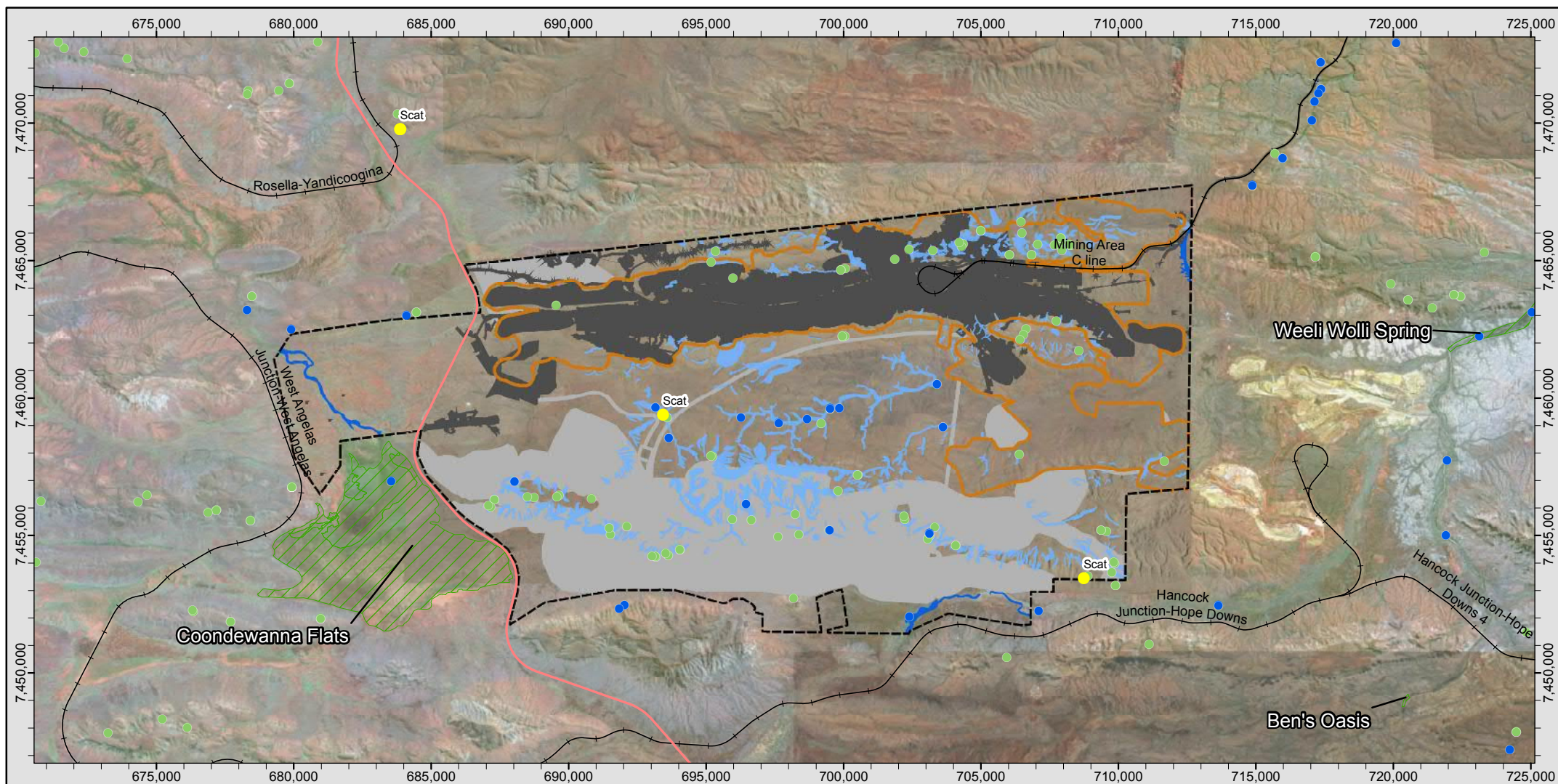
- BHP recordings of Northern Quoll
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- ▨ PECBoundaries
- ▭ Mining Area / Southern Flank Activity Area
- ▭ Mining Area C Expansion
- ▭ Mining Area C Exemption
- ▭ Southern Flank

Northern Quoll Potential for Preferred Habitat Modelling

- 1 - Lowest Potential Habitat Value
- 2
- 3
- 4 - Highest Potential Habitat Value

Liability
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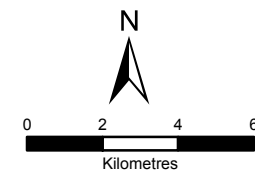
MINING AREA C - SOUTHERN FLANK

Northern Quoll Mapped Habitat
and Regional Records

Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/131 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.8
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Northern Quoll
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- ▨ PEC Boundaries
- ▭ Mining Area / Southern Flank Activity
- ▭ Mining Area C Expansion
- ▭ Southern Flank
- ▭ Mining Area C Exemption
- BHP Fauna Habitat Mapping**
- ▭ Gorge/ Gully
- ▭ Major Drainage Line

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Feral predators may compete with the northern quoll for food or may prey on it. The activity may attract feral predators to the area, with the establishment of water sources and food sources (landfills). Implementation of BHP standard practices for landfill management shall minimise the attraction of feral animals to the activity area.

The northern quoll is vulnerable to lethal toxic ingestion of cane toad toxin, and this is considered the main threat to northern quoll populations outside the Pilbara (Oakwood 2003; Hill & Ward 2010). The future predicted spread of the cane toad into the Pilbara bioregion may have comparable negative impacts to the northern quoll as observed in other areas of northern Australia. Some models predict that the cane toad's distribution will spread to include the Pilbara via the narrow coastal strip but that this spread will be dependent on artificial water bodies in this narrow strip (Tingley et al. 2013). It is acknowledged that introduction via vehicles or equipment can occur (Government of Western Australia, 2015).

As there is very few records of the northern quoll from the activity area, the risk of impact to the species is low. The Program Matter Outcomes for the northern quoll can be met by the activity.

4.5.5 Mitigation and Monitoring

The primary potential impact to the northern quoll from the activity is loss of potentially suitable habitat. Key management measures proposed to avoid or minimise this impact from the implementation of the activity include:

Minimise

- Minimise impacts to northern quoll significant habitat, by avoiding direct impacts where practicable through planning and implementing the PEHR internal process prior to land disturbance; and
- Minimise clearing of native vegetation, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable.

Table 4.9 outlines the monitoring of the mitigation measures to be implemented.

Table 4.9: Northern Quoll Assessment, Mitigation and Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Northern Quoll within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none"> • Presence of Northern Quoll habitat³³ within or adjacent³⁴ to the activity; or • Presence³⁵ of Northern Quoll individuals within or adjacent to the activity; or • A recorded Northern Quoll population or habitat within or adjacent to the activity; or • A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Northern Quoll. 									
Program Matter Outcome	<ul style="list-style-type: none"> • No loss of Northern Quoll population/s as a result of Program activities. • No loss of Northern Quoll habitat that supports a high density population³⁶ as a result of Program activities. • Loss of Northern Quoll habitat is offset³⁷ by measures that maintain or enhance the distribution and conservation status of the Northern Quoll 									
Review	Impact Assessment	Mitigation hierarchy?	Monitoring	Parameters	Performance Targets	Management Response	Location/s	Timing	Guideline	Validation
Baseline Modelled Data No high quality northern quoll Habitat (H4) occurs within the activity area. Regional Records Scats recorded approximately 5 km northwest and a male quoll observed 5 km east. Activity Area Revised Data and Information There is suitable habitat present in the form of gorge/gully habitat throughout the activity area. Approximately 2,105 ha of gorge/gully identified. Records of northern quoll from two locations.	Direct Impacts <i>Habitat loss</i> Disturbance of up to 1,123 ha of gorge and gully habitat for the activity. While local survey identified habitat that displays the physical attributes of suitable habitat for the northern quoll the survey data indicates the population of northern quoll occurs transiently or at very low density.	Minimise <ul style="list-style-type: none"> • Minimise impacts to northern quoll significant habitat, by avoiding direct impacts where practicable through planning and implementing the PEAHR internal process prior to land disturbance; • Minimise clearing of native vegetation, by utilising existing infrastructure and facilities, and disposing of waste rock within mine pits, where practicable. 	Land disturbance reconciliation Monitor the extent and location of land disturbance activities.	Disturbance to significant northern quoll habitat.	No unauthorised disturbance beyond the activity area.	Response actions to performance targets may include: <ul style="list-style-type: none"> • Remediation of habitat. • Construction/relocation (as appropriate) of, or alteration to, artificial northern quoll habitat. 	Aerial photography undertaken for the activity area.	Quarterly review and annual reporting.	BHP Offsets Plan - Land reconciliation process.	Objectives No significant impact to the long-term persistence and viability of the northern quoll within the Strategic Assessment Area from activities. Outcomes The activity area supports a transient or very low population of northern quoll. Implementation of the activity can meet the Program Matter Outcomes for the northern quoll.
			Population monitoring 10 yearly monitoring using targeted surveys.	Presence/absence of northern quoll.	Presence of species consistent with baseline data.		Activity area.	10 yearly.	Commonwealth of Australia 2016 EPBC Act referral guideline for the endangered northern quoll (and its revisions). BHP Biodiversity Environmental Management Plan (and its revisions).	

³³ Determined by baseline survey. Habitat as described in the National Recovery Plan for the Northern Quoll.

³⁴ For the purpose of the Northern Quoll, *adjacent to* means within 1 kilometre from the activity.

³⁵ Presence is demonstrated with evidence of northern quoll scat, digging, track, etc

³⁶ Defined as defined in EPBC Act referral guideline for the endangered northern quoll

³⁷ In accordance with Section 3.2 of the Program and the Offsets Plan

4.6 Ghost Bat

4.6.1 General Species Information

The ghost bat is the largest microbat in Australia and the second largest in the world (DotE 2016a). In the Pilbara region, the species occurs in all four sub-regions, and was recorded in 21 of the 24 areas surveyed by the Department of Parks and Wildlife during the Pilbara Biological Survey (2002-2007; see McKenzie & Bullen 2009). The largest populations occur within the Chichester sub-region, where known populations are largely restricted to disused mines.

The largest colonies of ghost bats in the Pilbara occur outside the Strategic Assessment Area where they roost in abandoned mines. Colonies within the Strategic Assessment Area are much smaller, and available data suggest that they likely depend on a number of roosts within their range. Ghost bat populations in the Chichester subregion, which occur outside of the Strategic Assessment Area, are considered significant; if impacted by habitat loss (due to collapse or reworking of mine adits) or from the arrival of cane toads, those populations within the Strategic Assessment Area will over time potentially become more important regionally.

4.6.2 Baseline Modelling Data

During the Strategic Assessment, the ghost bat was listed as a Vulnerable species under the EPBC Act on 5 May 2016 and was therefore included as a Program Matter for the Impact Assessment Report. As this species was a late inclusion in the Impact Assessment Report, a regional model was not developed; however, BHP conducted an impact assessment based on species records in order to determine cumulative impacts of the Program on the ghost bat.

BHP conducted a review of ghost bat records from the company's database and publicly available data supplied by the State Department of Parks and Wildlife (DPaW) and Western Australian Museum in December 2015 and January 2016 respectively. The review identified 1,028 records for ghost bats, of which 465 occurred within the Strategic Assessment Area. One hundred and seventy-five (175) records are predicted to be directly impacted by iron ore mining (reasonable foreseeable third party and BHP Full Conceptual Development) in the Pilbara. The data shows that the majority of the potential impact would be from BHP.

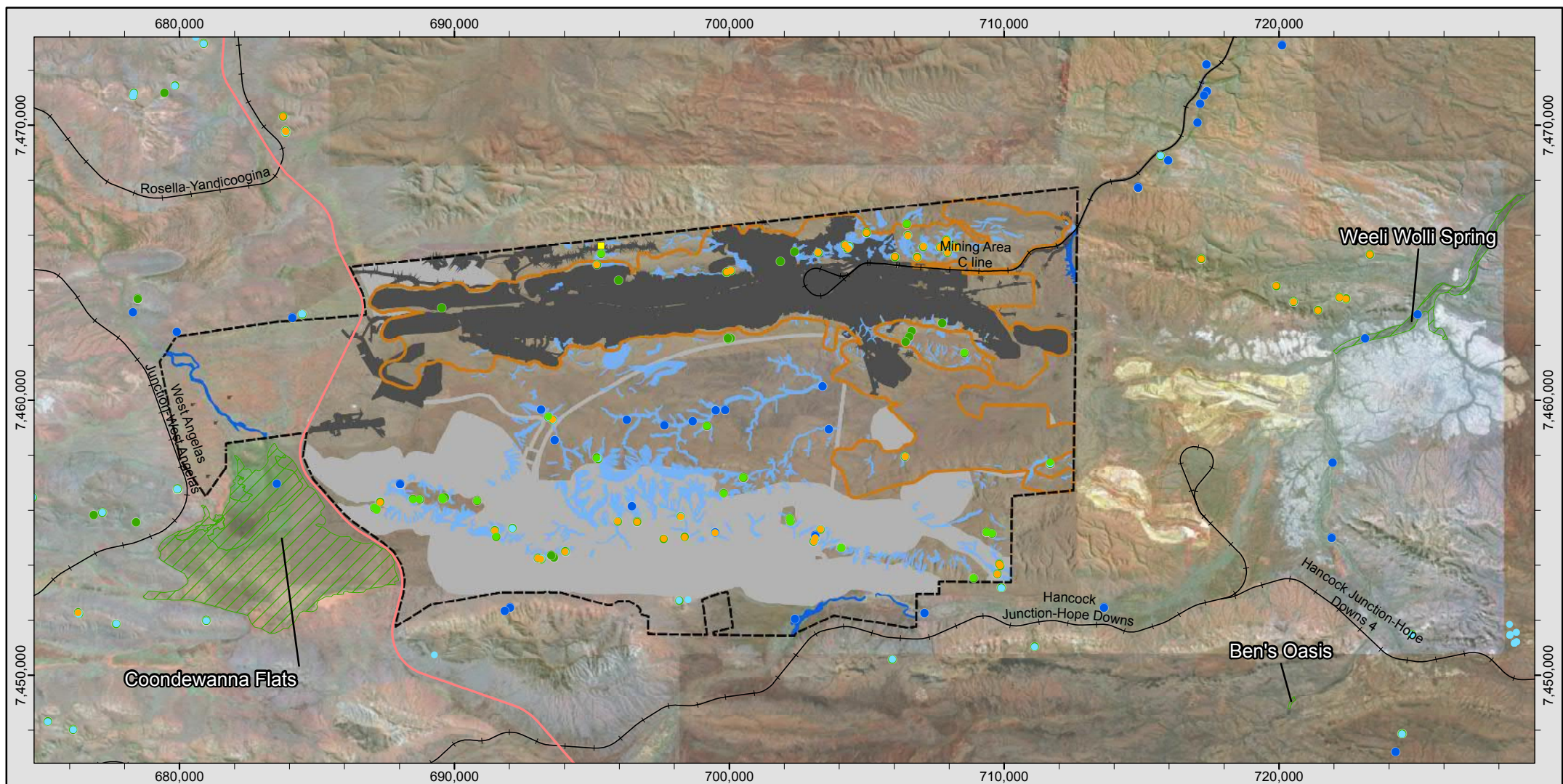
Figure 4.9 shows the known ghost bat caves and regional records within the activity area.

4.6.3 Revised Data and Information for this Notice

Armstrong and Anstee (2000) refer to the presence of two natural maternity roosts in the Hamersley Range, with one further roost in the Chichester Range. Recent work undertaken by Biologic (in prep.) in conjunction with the University of Queensland has documented the presence of pregnant females at seven caves in BHP's tenure in the eastern Hamersley Range during 2014 and 2015.

Sixty three caves have been recorded in the activity area (Figure 4.9). For the purposes of impact assessment, areas within 2 km of a ghost bat roost are considered to be foraging habitat. This foraging estimate is based on studies of the species in the Northern Territory that showed that ghost bats were foraging a distance of approximately 1.9 km from the roosts (Tidemann et al, 1985). When applying this estimate, there is approximately 20,920 ha of foraging habitat within the activity area.

It is estimated that the activity area supports approximately 50 individuals. The estimate for the Hamersley IBRA subregion is 300 to 400 individuals, which comprises one genetic population (Spencer and Tedeschi 2016). It is noted that preliminary genetic studies (Spencer and Tedeschi 2016) estimated the ghost bat population of the Hamersley subregion to be between 700 and 800 individuals.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK Ghost Bat Caves and Regional Records

Scale @ A4: 1:200,000	Prepared: P. GANT	Project No: A780/136 REV A
Date: 8/06/2018	Checked: J. ROBERTS	Figure: 4.9
Revision: Final	Reviewed: K. FLOWERDEW	

- BHP recordings of Ghost bat
- Ghost Bat Caves
- Ghost Bat Caves to be retained
- Artificial Ghost Bat Roost
- Cave
- Waterhole
- Great Northern Highway
- Existing Rail
- ▨ Priority Ecological Community

Mining Area / Southern Flank Activity Area

Mining Area C Expansion

Mining Area C Exemption

Southern Flank

BHP Fauna Habitat Mapping

Gorge/ Gully

Major Drainage Line

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0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

4.6.4 Impact Assessment

Habitat Loss

The primary impact to the ghost bat is the loss of roosting and foraging habitat. The activity construction and mining will require disturbance of 36 known ghost bat roosts and approximately 14,502 ha of foraging habitat. The roosts to be disturbed have varying value to the ghost bat. The ghost bat caves within the activity area have been classified as having High or Low value to ghost bats according to the following criteria:

- Low –considered currently to be used only as a feeding roost or have shown no sign of ghost bat use over multiple years of survey.
- High – All other caves, i.e. has suitable physical attributes for a day or maternity roost, ghost bats may have been recorded in the roost, and scat counts have indicated continual use over a period of years.

It is estimated that the activity area supports approximately 50 individuals. A local decrease in the number of ghost bats within the activity area is anticipated during active mining as a result of habitat loss. Preliminary genetic studies (Spencer and Tedeschi, 2016) estimated the ghost bat population of the Hamersley subregion to be between 700 and 800 individuals. At a species level, the potential loss of individuals within the activity area is considered minor.

Ground disturbance for the activity will result in the loss of suitable roosts and foraging habitat for the ghost bat, and may consequently cause a reduction in its area of occupancy. The ghost bat is highly mobile and regularly moves from cave to cave. Roost selection seems to be subject to environmental influence and may occur across the landscape subject to resource / food availability. While a local decrease in the number of ghost bats is anticipated, the aim of retaining 27 ghost bat caves (11 high value) in the activity area is to facilitate the return of the ghost bats following completion of mining. The suitable foraging habitat found within the activity area is contiguous with surrounding areas and are not considered uncommon in this part of the Hamersley Range. The impact to the population of ghost bats is considered minor. The Program Matter Outcomes for the ghost bat can be met by the activity.

Noise and Vibration

Responses to noise and vibration vary among vertebrate fauna species and individuals according to a number of factors (Busnel and Fletcher 1978). These include:

- the characteristics of the noise and its duration;
- life history characteristics of the species;
- habitat type;
- season;
- activity at the time of exposure;
- sex and age of the individual;
- level of previous exposure; and
- whether other stresses are present at the time of exposure.

Potential impacts to ghost bats from increased noise are considered to be minor. Noise modelling was undertaken to determine potential noise levels at the entrances to known caves inhabited by ghost bats (SVT 2016). All levels were predicted to be below 70 dB, with the highest levels ranging between 65 dB and 69.1 dB at three caves. A study undertaken by Bullen and Creese (2014) suggested that sound levels up to 70 dB are unlikely to result in ghost bats leaving their roost; therefore, the impacts of mining-related sound emissions are unlikely to be significant.

A vibration assessment undertaken to predict likely vibration levels experienced at ghost bat caves at various distances from a single hole and simultaneous blasting of 10 holes in soft and hard ground types (SVT 2016). It is suggested that ghost bats will be able to tolerate vibrations of up to 15 mm/s (R. Bullen, pers. comm.), although there has been no specific research undertaken to confirm this. Further, it would be very difficult to undertake an assessment of vibration tolerance at the activity area given the low likelihood of locating a continual population of

bats within a cave for study. The vibration assessment indicated for 10 blast holes in soft ground, the received vibration levels are predicted to be 3.4 mm/s at 1 km and 0.4 mm/s at 2 km, whilst for hard ground, the received vibration levels are predicted to be 19.6 mm/s at 1 km and 6.9 mm/s at 2 km. It is predicted that at 1.1 km a vibration of 15 mm/s will be experienced. One cave is located approximately 1.1 km from mining operations at Hope Downs 1. This cave continues to be used by ghost bats, and hormone analysis shows that pregnant females were using this cave in 2014 (Biologic, in prep). It is considered highly likely that the soft ground type would be applicable to caves within the activity area, based on current geological knowledge. The impacts of vibrations on retained caves are considered to be low.

Dust

Vegetation clearing, mining, hauling and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation. A result of this could be a decline in vegetation quality, although no prior studies have been able to detect a significant adverse impact of airborne dust on plant function in the Pilbara (Grierson 2015). If vegetation was to be affected this could impact faunal assemblages by reducing both food and habitat resources. The impacts of dust on the ghost bat are considered to be low.

Light

Artificial light could disrupt navigation, cause barriers to movement, impact foraging activity, cause abandoning of roosts and nests and expose nocturnal animals to nocturnal predators (Rich and Longcore 2006). Additional impacts associated with artificial light are considered to be minor and will be managed according to existing management strategies.

4.6.5 Mitigation and Monitoring

Key management measures proposed to avoid or minimise direct and indirect impacts from the implementation of the activity include:

Avoid

- Removal and relocation of OSAs from areas that contain ghost bat roosts;
- Modification of the clearing footprint to increase the number of ghost bat roosts to be retained.

Minimise

- BHP will, where practicable, retain a 150 m management area around the ghost bats roosts to be retained (one cave has a 60 m management area);
- Minimise impacts to known ghost bat cave locations and foraging habitat, by avoiding direct impacts where practicable through planning and implementing the PEAHR internal process prior to land disturbance;
- Removing/ replacing barbed wire fencing within 50 km of the activity area where practicable.

Table 4.10 outlines the monitoring of the mitigation measures to be implemented.

Table 4.10: Ghost Bat Assessment, Mitigation and Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Ghost Bat within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none">• Presence of Ghost Bat roosts¹ or foraging habitat within or adjacent² to the activity, or• Presence³ of Ghost bat individuals within or adjacent to the activity; or• A recorded Ghost Bat population or habitat within or adjacent to the activity; or• A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Ghost Bat.									
Program Matter Outcome	<ul style="list-style-type: none">• No loss of Ghost Bat population/s as a result of Program activities.• Loss of Ghost Bat habitat, including roosts, is offset⁴ by measures that maintain or enhance the distribution and conservation status of the Ghost Bat									
Review	Impact Assessment	Mitigation Actions	Monitoring	Parameters	Performance Targets	Management Response	Location	Timing	Guideline	Validation
Baseline Modelled Data There are estimated to be 317 caves in the Pilbara utilised by ghost bats (BHP 2016). Recent review of BHP caves data base estimates 369 caves have recorded ghost bat usage. Regional Records A recent estimate of its population size within the Pilbara has been given as 1,300 - 2,000 individuals (TSSC 2016a; Biologic & Bat	Direct Impacts <i>Habitat Loss</i> Disturbance of caves utilised by the ghost bat. The activity construction and mining, will impact 36 Ghost Bat caves (14 high value and 22 low value). Disturbance of up to 14,502 ha of ghost bat foraging habitat within the activity area. Indirect Impacts <i>Noise</i> Noise modelling indicated noise levels were below 70 db at all the ghost bat cave entrances. Bullen and Creese (2014) suggested that sound levels up to 70 dB are unlikely to	Avoid Retain 27 ghost bat roosts. Minimise Retaining a 150 m management area around the ghost bats roosts to be retained, where practicable. One roost has a 60 m management area) Minimise impacts to known ghost bat cave locations and foraging habitat, by avoiding direct impacts where practicable through planning and	Land disturbance reconciliation Monitor the location and extent of land disturbance activities.	Disturbance to ghost bat caves in the activity area during operations.	No land disturbance ²¹ within 50 m of ‘to be retained High value ghost bat caves’ or ‘artificial ghost bat roosts’. No disturbance ⁵ to any of the ‘to be retained High value ghost bat caves’ or ‘artificial ghost bat roosts’. No disturbance to any ‘to be retained ghost bat cave’ that renders it unsuitable ghost bat habitat.	Response actions to target exceedance may include, but are not limited to: <ul style="list-style-type: none">• Increase the frequency of the monitoring• Construction/relocation (as appropriate) of, or alteration to, artificial ghost bat habitat;• Reintroduction of ghost bats from captive breeding facilities or other natural colonies within the Pilbara, as appropriate; and/or	Aerial captures undertaken at activity area.	Quarterly review and annual reporting.	BHP Offsets Plan - land reconciliation process.	Objective No significant impact to persistence and viability of the ghost bat within the Strategic Assessment Area. Outcome A local decrease in the number of ghost bats within the activity area is anticipated during active mining. Retention of ghost bat caves in the activity area is expected to facilitate the return of the

¹ Determined by pre-disturbance survey. Roosting habitat as described in the Conservation Advice for the Ghost bat.

² For the purpose of the Ghost bat, *adjacent to* means (a) within 5 kilometres from the activity and (b) to the extent of a modelled groundwater drawdown from implementing the activity.

³ Presence is detected with evidence of Ghost bat guano, bat survey data, etc.

⁴ In accordance with Section 3.2 of the Program and the Offsets Plan

⁵ Direct disturbance to the cave that results in collapse or alteration of the cave that renders it unsuitable as a high value cave.

Program Matter Objective	To support the long-term persistence and viability of the Ghost Bat within the Strategic Assessment Area.									
Notifiable Trigger	<ul style="list-style-type: none">• Presence of Ghost Bat roosts¹ or foraging habitat within or adjacent² to the activity, or• Presence³ of Ghost bat individuals within or adjacent to the activity; or• A recorded Ghost Bat population or habitat within or adjacent to the activity; or• A circumstance that the approval holder considers may prejudice the Program Matter Objective for the Ghost Bat.									
Program Matter Outcome	<ul style="list-style-type: none">• No loss of Ghost Bat population/s as a result of Program activities.• Loss of Ghost Bat habitat, including roosts, is offset⁴ by measures that maintain or enhance the distribution and conservation status of the Ghost Bat									
Review	Impact Assessment	Mitigation Actions	Monitoring	Parameters	Performance Targets	Management Response	Location	Timing	Guideline	Validation
<p>Call WA 2014) estimated the Hamersley subregion to contain 300-400 individuals.</p> <p>Ghost bats are known from 171 locations, 35 caves recorded in BHP tenure.</p> <p>Activity Area Revised Data and Information</p> <p>20,920 ha of foraging habitat occurs within the activity area.</p> <p>Sixty three (63) caves utilised by Ghost Bats recorded within the activity area (25 high value, 32 low value).</p>	<p>result in ghost bats leaving their roost.</p> <p><i>Vibration</i></p> <p>It is suggested that ghost bats will be able to tolerate vibrations of up to 15 mm/s (R. Bullen, pers. comm.), although there has been no specific research undertaken to support this. Ghost bats may vacate a roost if disturbed by vibration during blasting.</p> <p><i>Infrastructure</i></p> <p>Ghost bats are known to become entangled in barbed wire due to their low elevation flying pattern (Armstrong and Anstee 2000).</p>	<p>implementing the PEHR internal process prior to land disturbance</p> <p>Removing/ replacing where practicable up to 50 km of barbed wire fencing in the vicinity of the activity.</p>	<p>Ghost bat viability and presence</p> <p>Monitoring Ghost Bat presence and or usage of the activity area.</p>	<p>Presence/absence of ghost bat.</p>	<p>Signs of ghost bat use in the 'to be retained' ghost bat caves or artificial roosts (if applicable) within the activity area, within 5 years of cessation of operations.</p>	<ul style="list-style-type: none">• Remediate foraging habitat to ensure that it contains feeding trees and suitable habitat for prey species within 2 km of cave locations.	<p>Ghost bat caves within the activity area.</p>	<p>Every 5 years during operations.</p> <p>Annual monitoring following cessation of operations.</p>	<p>Commonwealth of Australia 2010 Survey guidelines for Australia's threatened bats (and its revisions).</p> <p>BHP Biodiversity Environmental Management Plan (and its revisions).</p>	<p>ghost bats. following completion of mining.</p> <p>Implementation of the activity can meet the Program Matter Outcomes for the ghost bat.</p>

5 Offsets

5.1 Offsets Principles

As defined in the Commonwealth of Australia's (2012) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, suitable offsets must:

- 1 Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action;
- 2 Be built around direct offsets but may include other compensatory measures;
- 3 Be in proportion to the level of statutory protection that applies to the protected matter;
- 4 Be of a size and scale proportionate to the residual impacts on the protected matter;
- 5 Effectively account for and manage the risks of the offset not succeeding;
- 6 Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action);
- 7 Be efficient, effective, timely, transparent, scientifically robust and reasonable; and
- 8 Have transparent governance arrangements, including being able to be readily measured, monitored, audited and enforced.

5.2 Offsets Objectives

The environmental offset is directed at the residual impacts on ghost bat and Pilbara olive python from the activity. The objectives of the offset project are to:

- Be applied at the regional or landscape scale and relevant to the Strategic Assessment Area;
- Meet the requirements of both the Commonwealth and State offset obligations;
- Implement conservation actions in a coordinated way based on specific and clear investment decisions and achievement of measurable outcomes for the respective Program Matters;
- Focus on the highest-priority biodiversity issues (key threatening processes) in the region through the delivery of on-ground initiatives that are proportionate to the potential residual impacts;
- Build on environmental information and knowledge of research and learnings conducted to-date;
- Provide opportunities for partnerships between government, industry, landholders and Aboriginal communities;
- Be transparent, with robust governance arrangements that ensure offset outcomes can be readily measured, monitored and audited; and
- Be applied within an adaptive management framework.

5.3 Central Pilbara Land Management Project

In development of the offsets project, BHP has taken into consideration key threats and research priorities for the ghost bat and the Pilbara olive python (summarised in TSSC 2016c and TSSC 2008). Other key documents utilised to inform the offset project included the following documents:

- Conservation advice for the greater bilby (TSSC 2016a), northern quoll (TSSC 2005) and Pilbara leaf-nosed bat (TSSC 2016b);
- Greening Australia (2015) *Conservation Action Plan for the Pilbara Bioregion Summary Report (Draft)*;
- The Government of Western Australia (2014) *Cumulative environmental impacts of development in the Pilbara region*; and

- Carwardine *et al.* (2014) Priority Threat Management for Pilbara Species of Conservation Significance.

5.3.1 Project Overview

The land management offset project aims to address the current known threats to EPBC listed species in the Pilbara, i.e. degradation of habitats by introduced species and anthropogenic activities, and mining operations. An adaptive management approach will be implemented throughout the duration of the project to ensure that knowledge gained by BHP and others is incorporated into the outcomes of the offset package. Table 5.1 outlines the Central Pilbara Land Management Project. Further details of the land management offset project, as outlined in the Offsets Plan, will be provided to the DoEE within 6 months of the final Validation Notice.

Table 5.1: Central Pilbara Land Management Project 2020 -2025 Overview

Central Pilbara Land Management Project 2020 -2025 Overview	
Objective	To undertake land-based management of key threatening processes for the Program Matters.
Key threats to be managed	Modification of foraging habitat; Direct predation by feral cats and foxes and/or predation of food sources; and Collision with barbed wire fences.
Program Matter Outcomes	Loss of <i>Program Matter</i> habitat, is offset ¹ by measures that maintain or enhance the distribution and conservation status of the <i>Program Matter</i>
Management actions	<ul style="list-style-type: none"> • Feral animal control (targeting cats) • Fire control/ management • Removal and/or replacement of barbed wire fencing • Removal of cattle from newly excised land from pastoral leases and construction of exclusion fencing (where applicable); • Exclusion fencing around waterholes
Location of management	Either BHP managed pastoral lease(s) and or land excised from pastoralism during the 2015 Pastoral Lease Renewal
Initial duration	5 years commencing 2020
Stakeholder consultation and collaboration	<ul style="list-style-type: none"> • Traditional owners and Indigenous groups; • Pastoralists; • Department of Biodiversity, Conservation and Attractions; • Other regulators including DWER, DMIRS • Land management based Non Government Organisation (NGO); • BHP employees or contractors.

5.3.2 Project Schedule

Implementation of the Central Pilbara Land Management Project will be staged (Table 5.2). The schedule will be revised as the project is developed and implemented.

¹ In accordance with Section 3.2 of the Program and the Offsets Plan

Table 5.2: Central Pilbara Land Management Project Preliminary Schedule

Project Phase	Activity	Deliverable	Responsibility
Administration	Approvals	Endorsement of the offset project	BHP
		Approvals required for the offset achieved	BHP
Planning	Concept Development	Engagement with external stakeholders and organisations	BHP
		Site(s) evaluation and selection	BHP
Project Definition	Project Development	Workshop with collaboration partners	Service provider ¹
		Detailed Feral Animal Control Program	BHP/service provider
		Detailed Fire Control/Management Program	BHP/service provider
		Detailed Fencing Replacement and Exclusion Program	BHP/service provider
	Endorsement	Review approach and provide feedback	BHP
Implementation	Commencement of on-ground activities	Baiting program	BHP/service provider
		Fire management	BHP/service provider
		Fence replacement	BHP/service provider
	Monitoring	Fauna Monitoring	BHP/service provider
	Evaluation	Review of program efficacies and monitoring results	BHP/service provider
	Reporting	Annual report covering the previous 12 months	BHP/service provider

5.3.3 Implementation and Funding

The program will be implemented over a 5 year period, commencing by 2020. Implementation of the offsets project may be undertaken in partnership with the following:

- Indigenous Rangers; and/or
- Department of Biodiversity, Conservation and Attractions; and/or
- Land management based Non-Government Organisation (NGO); and/or
- BHP employees or contractors.

¹ A service provider may be a consultant, contractor or partner

BHP has committed to providing a financial contribution to this project. A provisional budget will be set aside in forward planning once the management plan components are fully costed. At the completion of the 5 year program a review of program success and funding arrangements will be undertaken.

6 Reporting

BHP will produce an Annual Environmental Report for all of its environmental obligations for each notifiable action under the Strategic Assessment Approval. As a minimum, the Annual Environmental Report will contain:

- Notifiable Actions identified under the Program;
- Details of activities within the scope of the Program which were commenced but were determined not notifiable;
- Status of implementation (planned start date, action commenced and planned completion date; and action completed) of all Notifiable Actions;
- Assets divested through the process described in Section 2.1 of the Program;
- Offsets implemented for each Notifiable Action;
- Where applicable, accumulated disturbance against Program Matter Outcome;
- Disturbance areas associated with all actions, whether material or non-material, implemented since the Approval. Both the annual disturbance and the total disturbance (since the Approval) will be included.
- Summary of any exceedances of the Program Matter Outcomes relevant to each Notifiable Action, and corrective actions taken; and
- deviations from the Program or from information contained in a Validation Notice for a Notifiable Action.

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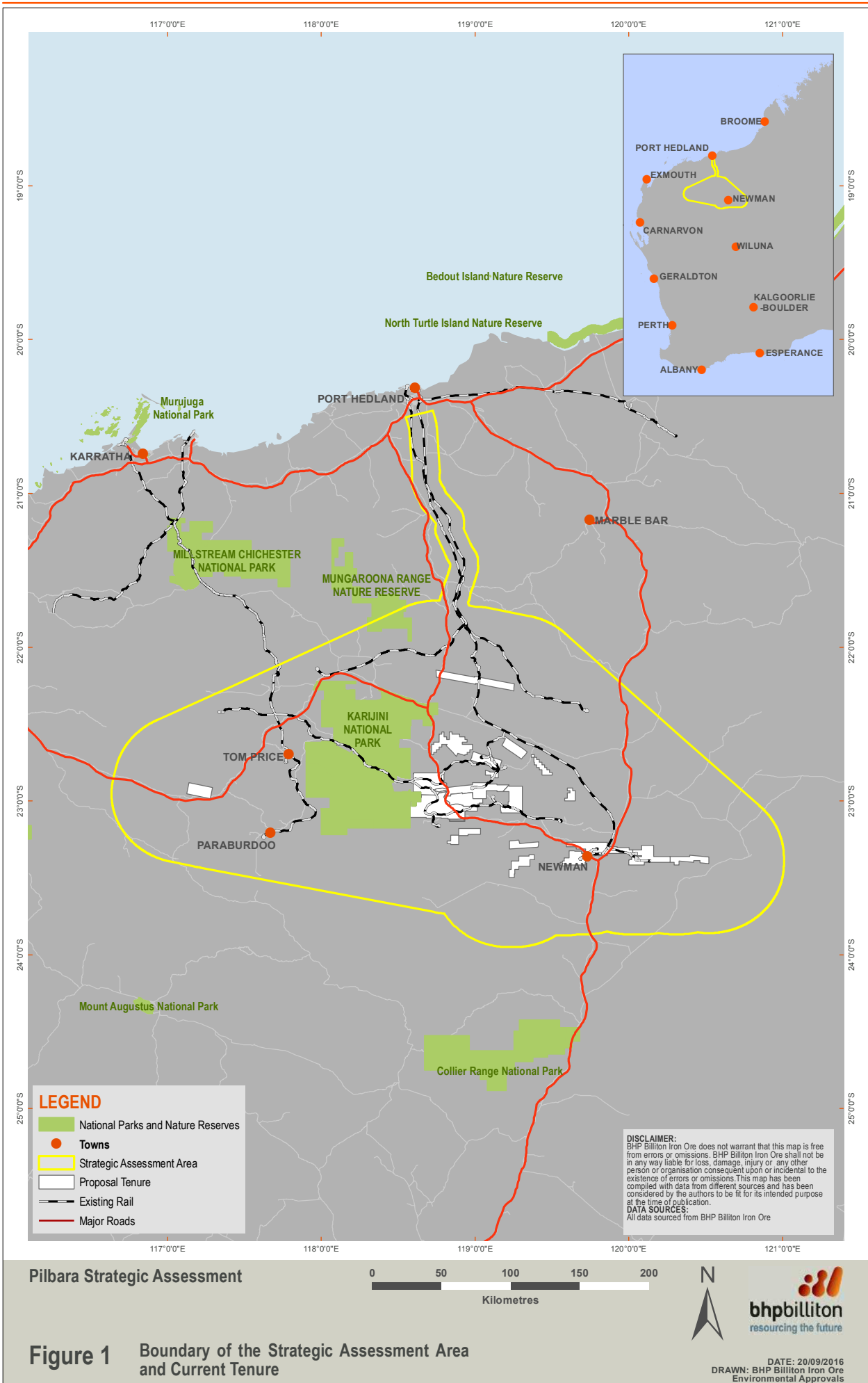
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Appendix 1: Strategic Assessment Area



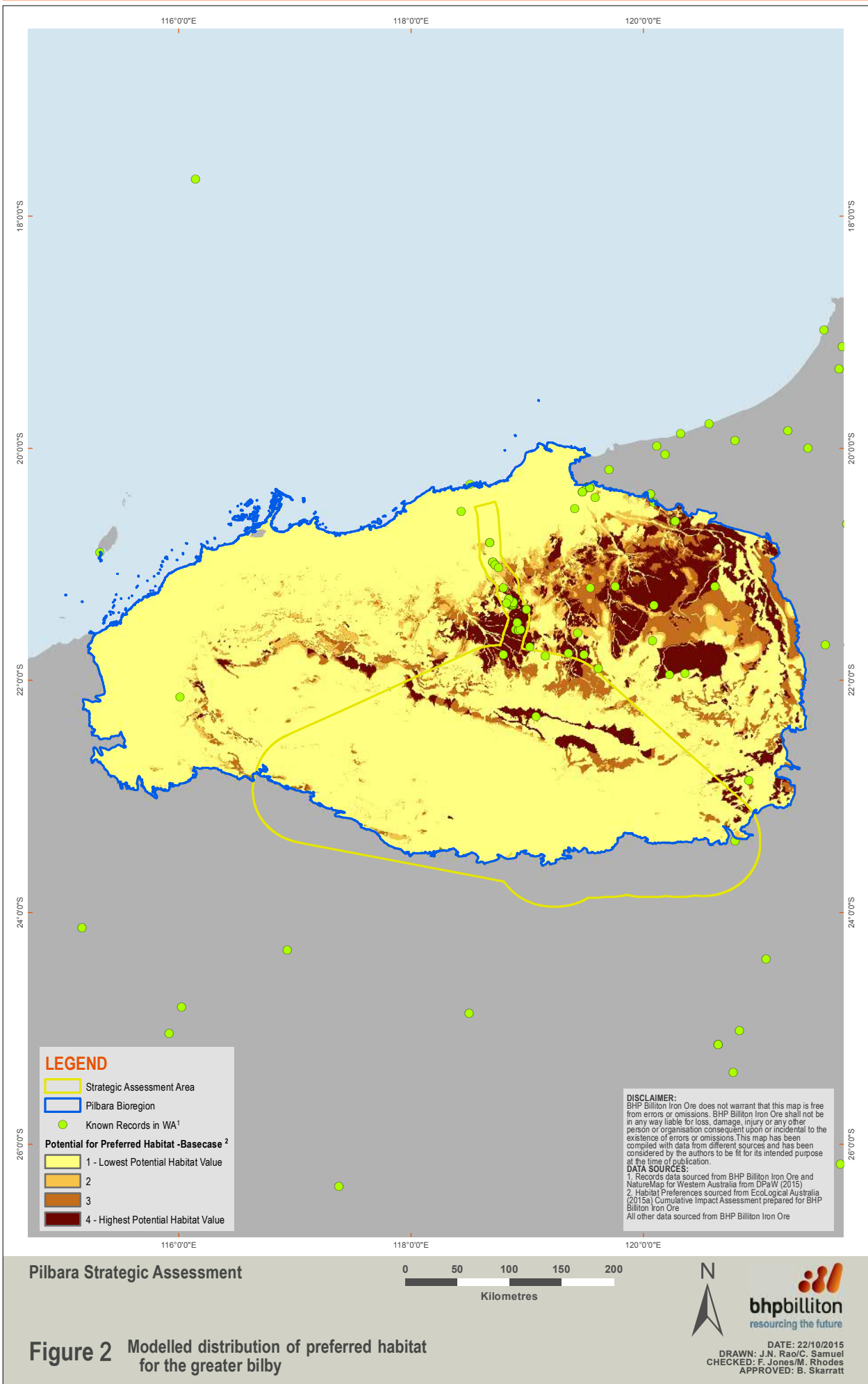
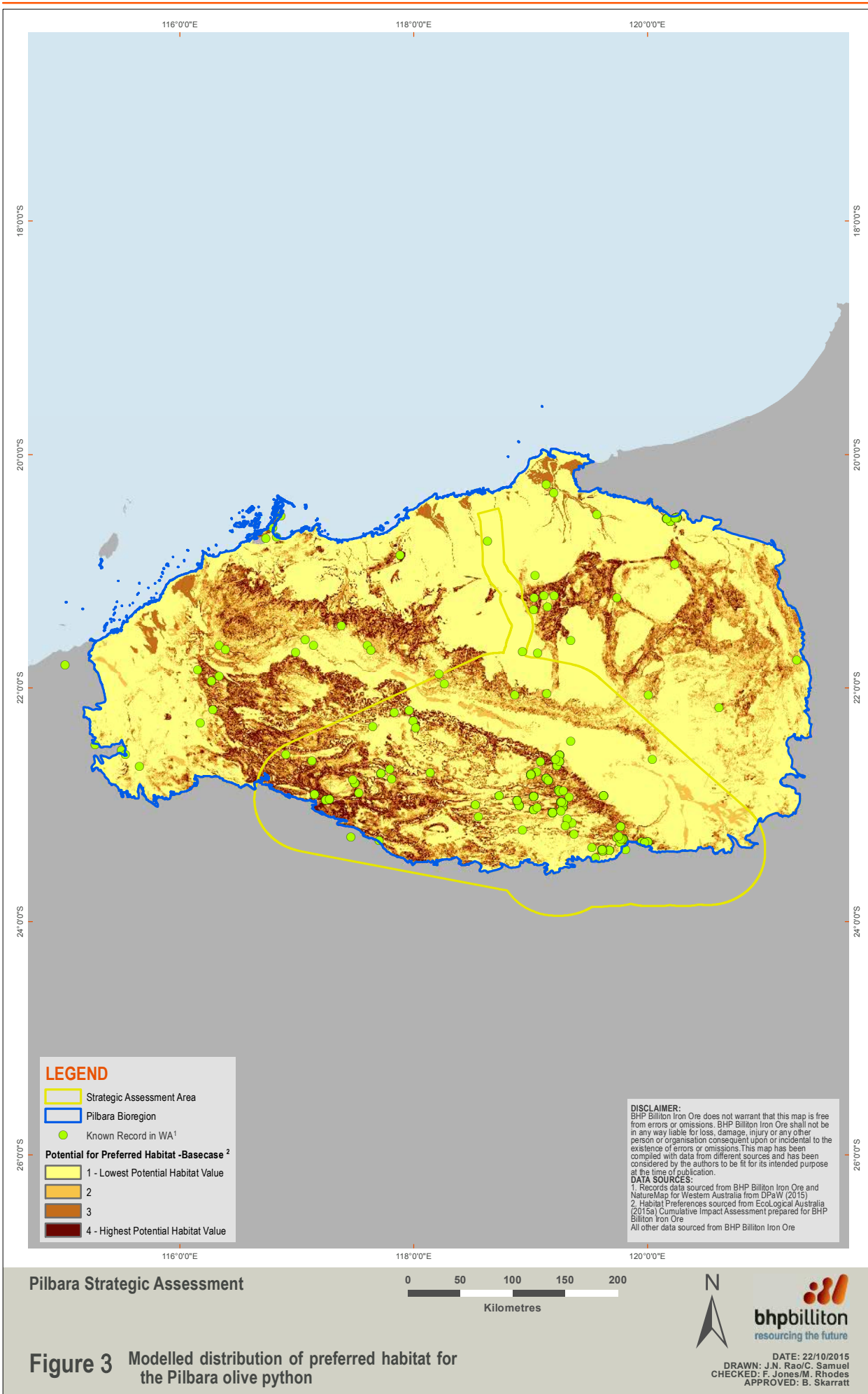
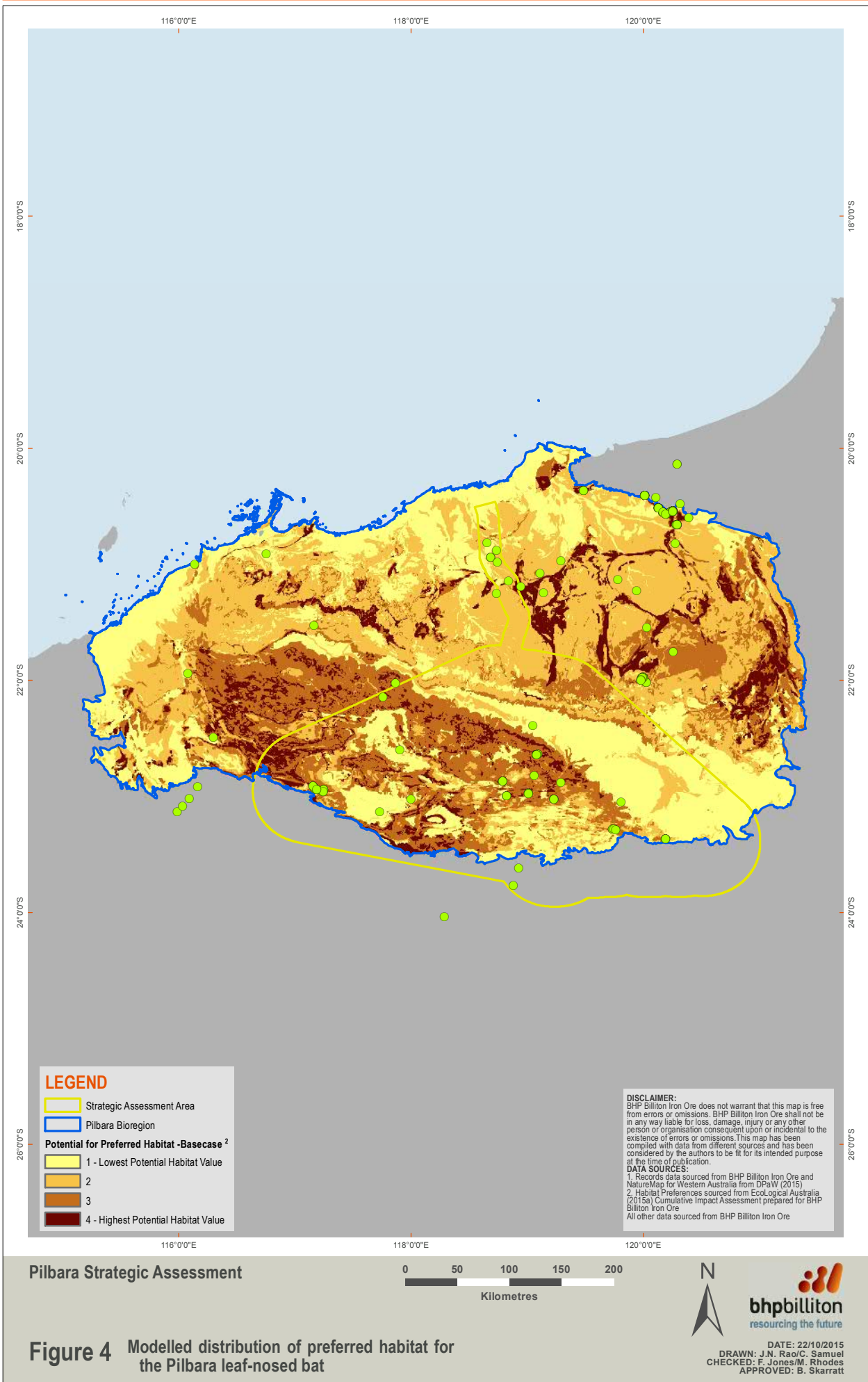
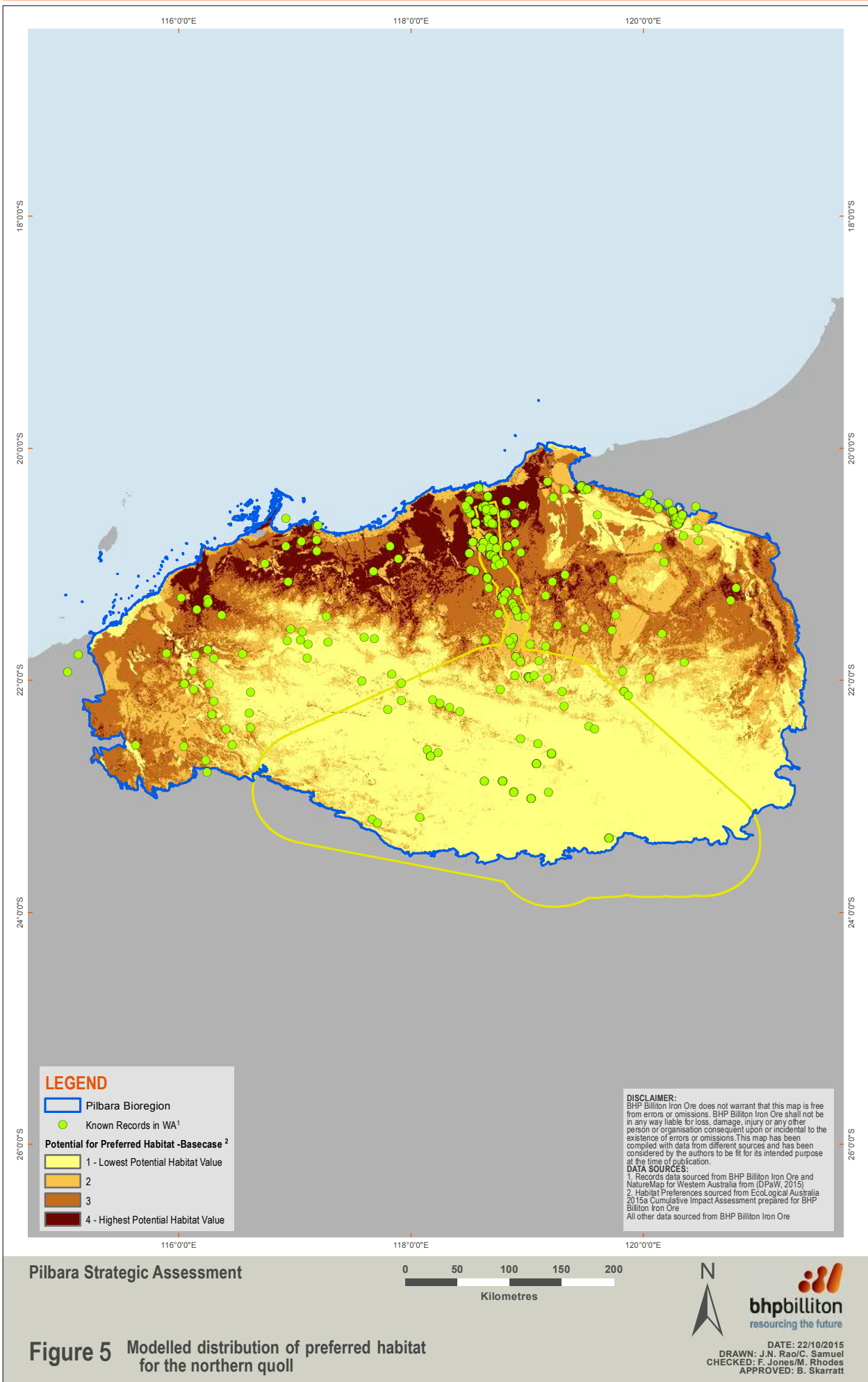


Figure 2 Modelled distribution of preferred habitat for the greater bilby







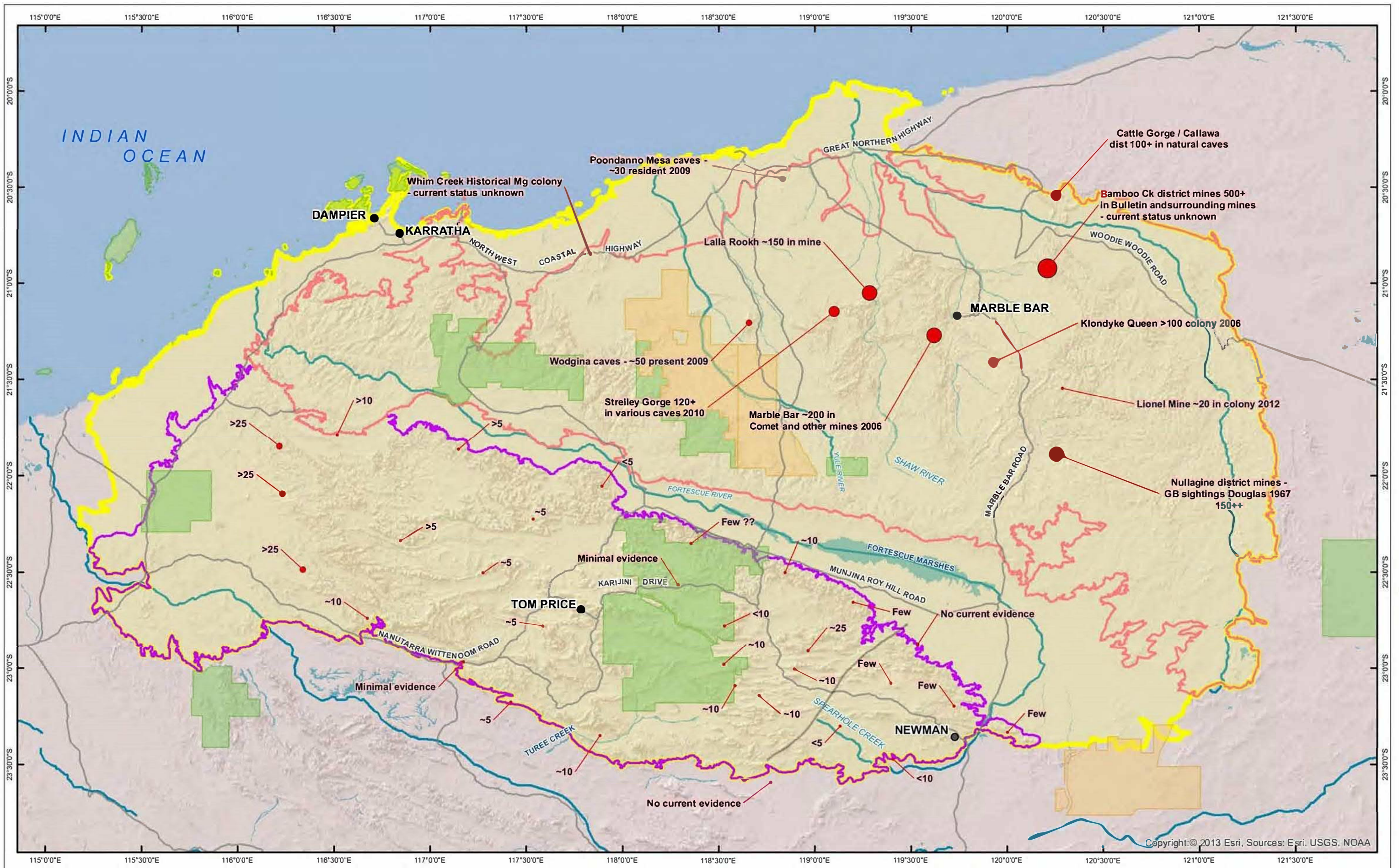


Figure 6
Ghost Bat Populations estimates based on records in the Pilbara

- Legend**
- Estimate of Ghost Bat individuals
 - ▭ Pilbara IBRA
 - ▭ Chichester Subregion (IBRA)
 - ▭ Hamersley Subregion (IBRA)
 - ▭ Indigenous Reserve
 - ▭ Nature Conservation Reserve

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Appendix 2: Terrestrial Fauna Surveys

Terrestrial Fauna Surveys

Survey	Mining Area C Biological Survey	Area C: Deposits D, E and F Biological Survey	Mining Area C Expansion Deposit E Bat Assessment	Area C R Deposit Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Terrestrial Vertebrate Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Bat Survey and Assessment	South Flank 2010 Bat Survey	Area C and Surrounds Fauna Study	Southern Flank Vertebrate Fauna Study	South Flank Bat Assessment Survey	Central Pilbara Ghost Bat Assessment	South Flank Targeted Northern Quoll Survey	Mudlark Vertebrate Fauna Study	Central Pilbara Ghost Bat Population and Roost Assessment: 2014	South Flank Targeted Fauna Survey
Consultant	ecologia	ecologia	ecologia	ENV	Outback Ecology	Specialized Zoological	Bat Call	Biologic	Biologic	Biologic	Biologic	Biologic	Biologic	Biologic	Biologic
Type	Single Phase Level 2	Single Phase Level 2	Targeted Survey	Single Phase Level 2	Single Phase Level 2	Bat Survey	Targeted Reconnaissance Survey for Bats	Two Phase Level 2	Two Phase Level 2	Targeted Bat Survey	Targeted Bat Survey	Targeted Survey	Two Phase Level 2	Targeted Bat Survey	Targeted Cons. Sig. Fauna Survey
Survey dates	14 Apr – 30 Apr 1998	28 May–7 Jun 2004	6-8 Sep 2005	22 Nov – 27 Nov 2006	17 Mar – 31 Mar 2008	17 -24 April 2008	Sep 2010 (2 days), Nov 2010 (1 day)	5 Oct – 18 Oct 2009 and 20 Mar – 1 May 2010	7 Apr – 19 Apr and 23 Aug – 4 Sep 2010	4-10 Nov 2011	24 Nov – 1 Dec 2012	24 June - 6 July, 13 -25 July 2012	12 – 19 May, 31 May – 11 June and 6-15 Oct 2011 19-22 Jan and 18-28 May 2012	12-16 Aug and 7-12 Nov 2014	19-22 Nov 2015. Cameras: 19 Nov – 17 Dec 2015
No. of trapping sites	11	6	0	4 full sites, 2 Elliott only sites.	4 full sites, 1 Funnel / Elliott only site	0	0	12 Sites. 5 run both Phases, 3 run first Phase only, 5 run second Phase only	10 Sites, two Phases	0	0	20	20	0	10
Trapping site configuration	CALM Pilbara grid	Linear transect or Grid. Varied, inconsistent.	N/A	2 pot trap, 2 funnel, 10 Elliott, 5 Cages	Linear transect or Grid. Varied, inconsistent.	N/A	N/A	Linear transect. 5 Bucket, 5 PVC, 20 Funnel, 20 Elliott, 2 Cage	Linear transect. 5 Bucket, 5 PVC, 20 Funnel, 20 Elliott, 2 Cage	N/A	N/A	20 Cage or large Elliott traps	Linear transect. 5 Bucket, 5 PVC, 20 Funnel, 20 Elliott, 2 Cage	N/A	Remote sensor camera
Nights trapped	Average of 5.9, range from 5 to 7	7	N/A	3 (3 sites), 4 (1 site)	Average of 5.6, range 4-7	N/A	N/A	6	6-8	N/A	N/A	14	7	N/A	N/A
Cage nights	0	0	N/A	100	48	N/A	N/A	216	280	N/A	N/A	3535	560	N/A	N/A
Elliott nights	1180	840	N/A	185	590	N/A	N/A	2160	2800	N/A	N/A	0	5600	N/A	N/A
Funnel nights	0	336	N/A	280	149	N/A	N/A	2160	2800	N/A	N/A	0	5600	N/A	N/A
Bucket nights	265	210	N/A	0	85.5	N/A	N/A	540	700	N/A	N/A	0	1400	N/A	N/A
PVC Pipe nights	265	210	N/A	0	85.5	N/A	N/A	540	700	N/A	N/A	0	1400	N/A	N/A
Pot nights ⁴⁵	0	0	N/A	280	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
Total Trap nights	1710	1596	N/A	845	958	N/A	N/A	5616	7280	N/A	N/A	3535	14560	N/A	N/A
Diurnal search (hrs)	62.5	39.3	Not stated (searched 10 gullies and gorges)	23	5	Not stated	N/A	51.2	152	N/A	N/A	320	58.3	N/A	40

⁴⁵ Small 500 ml ‘pots’ employed as a means of potentially trapping small sub-fossorial taxa.

Survey	Mining Area C Biological Survey	Area C: Deposits D, E and F Biological Survey	Mining Area C Expansion Deposit E Bat Assessment	Area C R Deposit Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Terrestrial Vertebrate Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Bat Survey and Assessment	South Flank 2010 Bat Survey	Area C and Surrounds Fauna Study	Southern Flank Vertebrate Fauna Study	South Flank Bat Assessment Survey	Central Pilbara Ghost Bat Assessment	South Flank Targeted Northern Quoll Survey	Mudlark Vertebrate Fauna Study	Central Pilbara Ghost Bat Population and Roost Assessment: 2014	South Flank Targeted Fauna Survey
Nocturnal search (hrs)	10	20		Not stated	5	0	N/A	48	48	N/A	N/A	0	80	N/A	N/A
Bird surveys (hrs)	44	35	N/A	18.5	22	N/A	N/A	35.3		N/A	N/A	0	40	N/A	N/A
Bird survey method	1 hr set-time period survey, 2 x AM, 1 x mid-day, 1 x PM	20 min set time period	N/A	Opportunistic	30 or 60 min set time period.	N/A	N/A	20 min set time period	20 min set time period	N/A	N/A	N/A	20 min set time period	N/A	N/A
Bat recording (nights)	0	3	2	4	0	4	1	23	22	20	N/A	0	22	N/A	N/A
Bat recording (hrs)	0	3	5	5.3	0	Unknown	8	>180	>180	160	N/A	0	>180	N/A	N/A
No. Caves Assessed	0	0	0	0	0	0	0	0	0		47	0	0	68	N/A
Bat survey method	Mist nets	ANABATTM	ANABATTM II, cave searches	ANABATTM	Conducted by Specialized Zoological	ANABATTM SD-1, gully searches, Harp trap, cave entrance examination using video or barrier	ANABATTM II, cave searches	ANABATTM II and ANABATTM SD-1, gully searches	ANABATTM II and ANABATTM SD-1, gully searches	Guano sheets, counts, still camera, video camera, SM2 Songmeter, cave searches	Cave assessment, nocturnal count, video camera, motion detecting camera, SM2	N/A	SM2, cave searches	Cave assessment, guano sheets, SM2, motion cameras, infrared video, 3D cave mapping,	N/A
Limitations	No cage traps used. Pre-ANABATTM and pre-funnel trap use. Single Phase only. Sites 6 and 11 Elliott traps only.	The cool winter weather is likely to have reduced the number of reptile species recorded.	Bat survey only	Fire on 24th November. Sites 1, 3, 4 and 6 affected. Pot traps instead of bucket or pipe. Pot traps not used at Sites 1 and 10. Site 6 consisted of Elliotts around a pebble mound. Very	South-west of survey area was burnt. Trap line configuration and layout varied considerably between sites. Trap line number of nights varied across sites. Bird survey periods varied in length.	Bat survey only	Bat survey only	Bird surveys inconsistent between sites.	Prevailing dry conditions may have reduced capture rates.	Not all areas of caves able to be surveyed due to safety or access restrictions	Not all areas of caves able to be surveyed due to safety or access restrictions	None	None	Not all areas of caves able to be surveyed due to safety or access restrictions	Fire affected ~40 % of camera trapping sites in November.

Survey	Mining Area C Biological Survey	Area C: Deposits D, E and F Biological Survey	Mining Area C Expansion Deposit E Bat Assessment	Area C R Deposit Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Terrestrial Vertebrate Fauna Assessment	Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits: Bat Survey and Assessment	South Flank 2010 Bat Survey	Area C and Surrounds Fauna Study	Southern Flank Vertebrate Fauna Study	South Flank Bat Assessment Survey	Central Pilbara Ghost Bat Assessment	South Flank Targeted Northern Quoll Survey	Mudlark Vertebrate Fauna Study	Central Pilbara Ghost Bat Population and Roost Assessment: 2014	South Flank Targeted Fauna Survey
				limited trapping. Casual bird observations											
Notes				Australian Bustard is listed as recorded in the appendices, but text specifically says that it was not recorded.	Pit traps are not discriminated so a ratio of 50:50 is assumed. Bat survey conducted by Specialized Zoological (separate report)			Hair trap sites and camera traps were used. Extensive searches of gully systems and gorges for caves suitable for Ghost Bat and Pilbara Leaf-nosed Bat.	Hair trap sites and camera traps were used. Extensive searches of gully systems and gorges for caves suitable for Ghost Bat and Pilbara Leaf-nosed Bat.	24 nights of still camera recording, 4 nights of video camera recording, min. 48 nights of guano sheets.					

