Appendix H

Northern Quoll (Species) Management Plan

Mount Emerald Wind Farm

Northern Quoll Species Management Plan

Prepared by:

RPS AUSTRALIA EAST PTY LTD

135 Abbott Street
PO Box 1949
CAIRNS QLD 4870

T: +61 7 4031 1336
F: +61 7 4031 2942
E: mellissa.jess@rpsgroup.com.au

Prepared for:

RATCH AUSTRALIA CORPORATION LTD

Level 4,
231 George Street
BRISBANE QLD 4000

T: +61 7 3214 3401
F: +61 7 3214 3499
E: terry.johannesen@ratchaustralia.com
W: www.ratchaustralia.com

Client Manager: Mellissa Jess
Report Number: PR128938-2
Version / Date: Final - November 2016 / R75725

IMPORTANT NOTE

We have prepared this report for the sole purposes of RATCH Australia Corporation Ltd ("**Client**") for the specific purpose of only for which it is supplied ("**Purpose**"). This report is strictly limited to the purpose and the facts and matters stated in it and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

This report is presented without the assumption of a duty of care to any other person (other than the Client) ("**Third Party**"). The report may not contain sufficient information for the purposes of a Third Party or for other uses. Without the prior written consent of RPS Australia East Pty Ltd:

(a) this report may not be relied on by a Third Party; and

(b) RPS Australia East Pty Ltd will not be liable to a Third Party for any loss, damage, liability or claim arising out of or incidental to a Third Party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

If a Third Party uses or relies on the facts, content, opinions or subject matter contained in this report with or without the consent of RPS Australia East Pty Ltd, RPS Australia East Pty Ltd disclaims all risk and the Third Party assumes all risk and releases and indemnifies and agrees to keep indemnified RPS Australia East Pty Ltd from any loss, damage, claim or liability arising directly or indirectly from the use of or reliance on this report.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

Document Status

Version	Purpose of Document	Orig	Review	Review Date
1	Report	MJ	DF	07/03/2016
2	Report	MJ	LL	10/06/2016
3	Report	MJ	TJ	14/06/2016
4	Final Repot	MJ	TJ	15/11/2016

Approval for Issue

Name	Signature	Date
Mellissa Jess		15/11/2016

Contents

Tables

Figures

1.0 Introduction

This Species Management Plan (SMP) has been prepared by RPS Australia East (RPS) on behalf of RATCH Australia Corporation Ltd (RATCH) to minimise the potential impacts on the Northern Quoll *Dasyurus hallucatus* from the construction and operation of the Mount Emerald Wind Farm (MEWF) Project.

The Northern Quoll is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Nature Conservation Act 1992* (NC Act).

The Species Management Plan outlines the procedure for land clearing and development of turbines in areas that may contain the Northern Quoll and for *tampering* with *animal breeding places* being used by the above species to incubate or rear the animal's offspring in accordance with section 88 of the NC Act and section 332 of the *Nature Conservation (Wildlife Management) Regulation 2006* (WMR).

This SMP should also be used in conjunction with the MEWF Outcomes Strategy (Burnett, 2016) for the Northern Quoll, which details monitoring strategies for the species on the MEWF project site. This will be updated over the course of the development.

In preparing the Environmental Impacts Statement (EIS) (RPS, 2013) for the MEWF Project, several specialist investigations were undertaken and accompanying technical reports prepared. These include the disciplines of flora, fauna, general environmental reporting and offsets plan; town planning; aeronautical assessment; transport and traffic assessment; shadow flicker, electromagnetic interference, and energy yield; geotechnical; visual and landscape aesthetics; noise mapping; cultural heritage; community consultation; and social and economic assessment.

Several strategic and site-based plans have now been compiled to facilitate the delivery of mitigation measures. These are incorporated into the Environmental Management Plan (EMP). The EMP is to be supported by a number of sub-plans including: a Rehabilitation Plan, Weed and Pest Management Plans, Fire Management Plan and this SMP. These plans will have an effective life span to include the decommissioning phase and will be revised periodically to reflect ongoing changes and improvements.

1.1 The Project

The Mount Emerald Wind Farm is approved for the construction of up to 63 wind turbines on an elevated site approximately 20km SSW of Mareeba on the Atherton Tablelands in north Queensland (**Figure 1**). The towers will be approximately 80-90m high with approximately 50m blades, utilising 3 MW machines.

The site where the wind turbines, interconnecting tracks and associated infrastructure are to be established is on land formally described as Lot 7 on SP235224, which encompasses an area of 2,422ha. This land forms the terminus of the Herberton Range and is contiguous with Mount Emerald (proper) at its southern boundary. Virtually all the wind farm project area is covered by remnant and relatively undisturbed vegetation, where the only existing land modification is associated with a 275 kV transmission line and its series of access tracks. Kippen Drive at the base of the site is severely degraded in most zones adjacent to the unsealed road and weeds are conspicuous.

The wind farm site has been selected on the basis that it represents an excellent wind resource because of its elevated position and series of high ridges. The elevation range of the site is between 540m up to 1089m above sea level (ASL). The highest ridges south of the existing 275 kV transmission line hold the most significant value in terms of flora and represent an important tract of land with functional connectivity to other regional nodes of high biodiversity importance. Although land to the north of the transmission line (including

the landmark of Walsh Bluff) possesses lower floristic diversity, it is recognised for its habitat value for the endangered Northern Quoll (which is also expected to occur south of the transmission line).

The wind farm project estimates to deliver in the order of 650,000 megawatt hours of renewable energy, which is predicted to meet the annual needs of approximately 75,000 North Queensland homes over a 20 year period.

The wind farm will be connected to the existing Chalumbin – Woree 275 kV transmission line via a substation, which is to be located within the site. The 275 kV transmission line infrastructure that traverses the site was established in 1998 and represents a pre-existing disturbance footprint. Therefore, this pre-existing disturbed area will be utilised by the proposed MEWF to minimise the area of new impacts to the environment.

From a constructability perspective the northern sector of the site has more undulating landforms and fewer dissected ridges with precipitous drop offs. There also appears to be a higher proportion of former landscape disturbance in the northern sector and across the east-facing slopes on the Walkamin side.

Access to the site will be via Kennedy Highway, onto Hansen Drive and then into the site at a realigned Springmount Road - Kippen Drive intersection. Kippen Drive is currently unsealed. A series of access and interconnecting tracks will need to be constructed within the wind farm site, and will take advantage of existing transmission line infrastructure tracks wherever possible. A number of new tracks will need to be constructed to an initial cleared width of 10m. The interconnecting tracks will form the routes for the inter-turbine underground cabling - expected to be buried in trenches at approximately 1m deep.

Each turbine construction pad is expected to occupy an area in the order of 40m (long) x 60m (wide). The substation and associated compound will be in the order of 200m x 200m or similar configuration and will be located close to the existing 275 kV transmission line which transects the site.

Wind turbines will be "micro-sited" - a technique which involves selecting a position in the landscape where the least environmental impact is expected to occur. As part of this procedure, comprehensive ground surveys will be undertaken of each site to ensure impacts to conservation significant species and other matters of importance are minimised or avoided.

A wind farm operations building will be constructed adjacent to the substation, which will house monitoring and communications equipment. Other associated internal infrastructure will include car parking areas, construction compound and machinery area. Depending on the outcomes of relevant approvals, a batching plant may be temporarily constructed within the site.

The Mount Emerald Wind Farm project has been broadly categorised into four phases: pre-construction, construction, operation and maintenance and decommissioning. Rehabilitation and impact mitigation will be actively practiced throughout these stages and will be informed by respective plans and strategic documents.

1.2 Construction Process

The process for construction of the wind farm will generally follow;

- Site Establishment – construction of road to the site and establishment of an area for site offices and equipment storage;
- Access Roads – the construction of access roads to each of the wind turbine sites;
- Hardstands – an area will be cleared at each site to allow for the assembly of the various components;

- Footings – excavation, followed by the placement formwork and reinforcement and then concrete to form the turbine footing;
- Turbine Assembly – the various components are delivered to site and assembled to form the complete wind turbine;
- Cabling – turbines will be linked into common circuits via underground electrical cables buried in accordance with Australian Safety standards. The cables will generally follow the site access roads. Trenches will typically be 0.5m wide and 1m deep with cables buried at 0.7m.
- Collection Substation – all cabling circuits will terminate at a common point, namely the project substation. The substation will also include additional infrastructure to facilitate the connection of the wind farm to the existing electricity grid; and
- Earthworks on site will typically follow a similar process, consisting of initial clearance, followed by the specific task (road, hardstand footing) and then remediation.

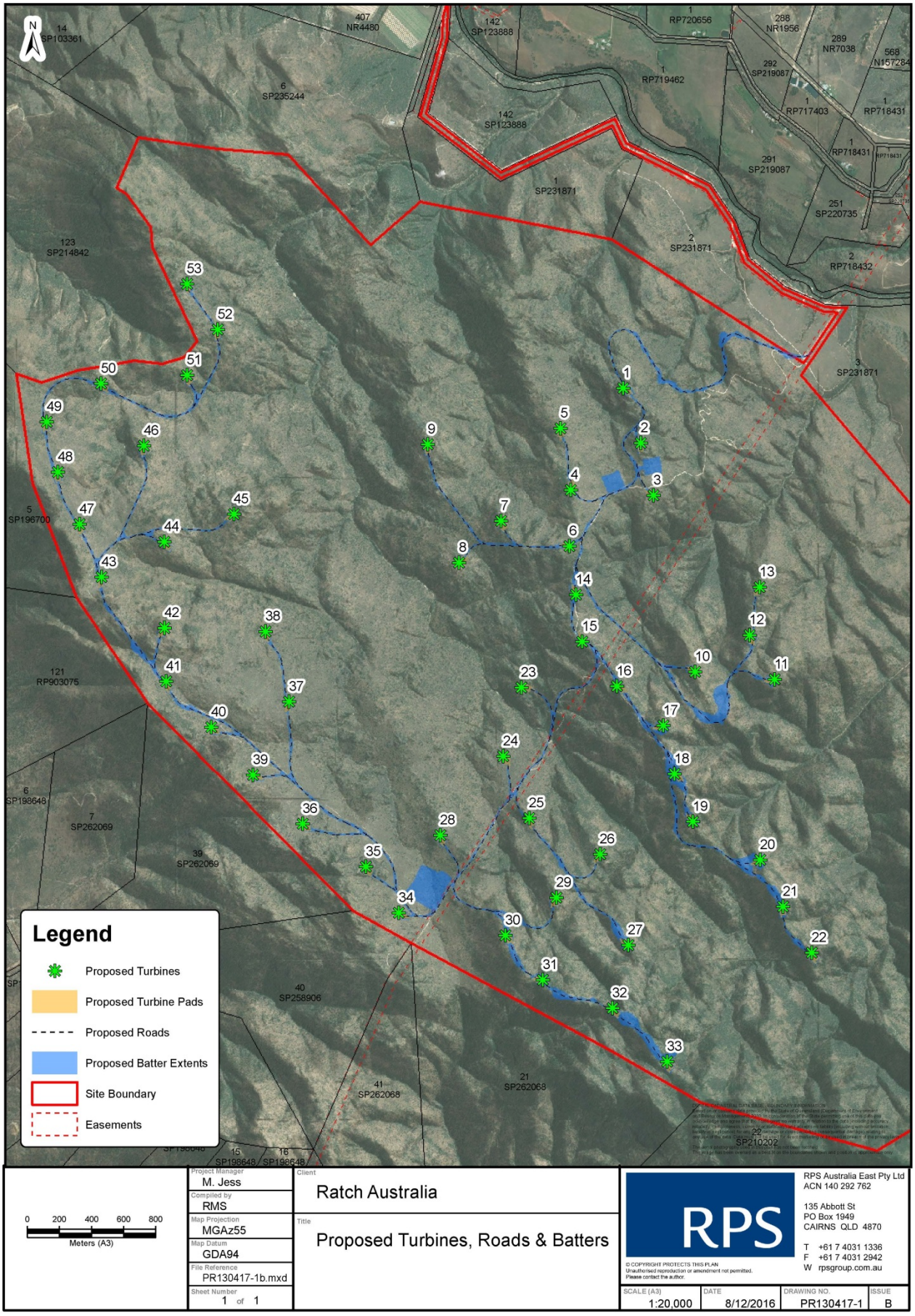

Figure 1 Site Location

1.3 Approved Entity

The following entity is approved to operate under this SMP:

Terry Johannesen
RATCH Australia
Level 4,
231 George Street
BRISBANE QLD 4000

T: +61 7 3214 3401
F: +61 7 3214 3499
E: terry.johannesen@ratchaustralia.com

The Approved Entity is responsible for ensuring all employees and contractors (Approved Parties) engaged in development activities undertaken at the Mount Emerald Wind Farm covered by this SMP comply with the requirements of this SMP. Approved Parties may include machinery operators, site supervisors and drivers.

1.4 Organisational Summary

This SMP only applies to construction and operation activities at the MEWF Project site.

1.5 Term of Approval

Should this SMP be approved by the delegate, MEWF requests it be approved for the maximum period of three years as per the *Nature Conservation (Administration) Regulation 2006.*

2.0 Legislative Framework

2.1 Approval Conditions

This plan has been set out in accordance with the *MEWF Outcomes Strategy* (Burnett, 2016) developed under the EPBC Approval conditions and requirements with specific targets as identified under section 13 of the DSDIP approval, which are detailed below.

2.1.1 *Sustainable Planning Act 2009*

Conditions relevant to the preparation and implementation of the Significant Species Management Plans are detailed in Condition 13 of the Ministerial Decision Notice.

2.1.1.1 Ministerial Decision Notice

The Development Notice (dated 18 December 2015) in accordance with the SPA included a number of conditions relating to the preparation of a Significant Species Management Plan. *Condition 13 - Environmental Management* which relates to the SMP, states the following:

Submit to the chief executive administering the SPA an Environmental Management Plan (EMP) prepared by a suitably qualified person(s). The EMP must:

i. be generally in accordance with the Preliminary Environmental Management Plan prepared by RPS and dated November 2013 and the draft Statement of Commitments contained within Appendix A of the RPS Development Application Material Change of Use Report dated March 2012;

ii. be based on the revised Turbine Location and Development Footprint Plan submitted in accordance with condition 2 of this approval;

iii. include the following components:

- *a significant species management plan.*

Significant species management plans must:

a) include plans for all wildlife species listed as Endangered, Vulnerable, or Near Threatened under the provisions of the Nature Conservation Act 1992 that:

i. are currently known to occur within or periodically utilise the site; or

ii. are detected within the site during the conduct of further baseline, construction or operational monitoring pursuant to other conditions; and

iii. are not the subject of an equivalent management plan prepared in satisfaction of an approval issued under the provisions of the Environment Protection and Biodiversity Conservation Act 1999 (Cth)".

b) *set out key impact management strategies including:*

i. further baseline programs;

ii. management targets;

iii. design, construction and operations impact avoidance and mitigation measures and protocols;

iv. quantitative performance indicators;

v. monitoring and reporting regimes;

vi. corrective actions;

vii. timeframes for identified actions; and

viii. applicant and stakeholder responsibilities.

2.1.2 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC)

The EPBC Referral Approval 2011/6228 conditions are very specific in the management of the Northern Quoll. The purpose of the Outcomes Strategy is to protect the population of this species, its habitat and the ecological integrity of the MEWF project site throughout the duration of works on the site. The relevant conditions of the EPBC Referral Approval which refer to the Northern Quoll SMP are contained in **Table 1**.

Table 1 Conditions of EPBC Referral Approval

Species	Condition
Northern Quoll	For the protection of the Northern Quoll, the approval holder must maintain a viable population of Northern Quoll on the wind farm site.
Northern Quoll	The approval holder must prepare and submit an Outcomes Strategy for the Minister's written approval which describes a monitoring program to inform adaptive management and determine whether the outcome required under condition 7 is being or has been met. The Outcomes Strategy must: (a) be prepared by a suitably qualified expert; (b) identify and justify performance measures, which are capable of accurate and reliable measurement, and will be used to measure the outcome required under condition 7; (c) include a monitoring program, to detect changes in the performance measures. The monitoring must include baseline surveys, control sites and experimental design (to test the effectiveness of different management measures); and (d) describe how the baseline and monitoring data will be adequate to: inform adaptive management; enable an objective decision to be made on whether the outcome described in condition 7 has been met.
Northern Quoll	The approval holder must not commence construction until the Minister has approved the Outcomes Strategy in writing.
Northern Quoll	The approved Outcomes Strategy must be implemented.
Northern Quoll	If the Minister is not satisfied that either the outcomes required under condition 7 are likely to be achieved, or there is insufficient evidence that the outcomes required under condition 7 are being achieved, the Minister may (in writing) require the approval holder to submit a plan for the Minister's approval to reduce, mitigate, remediate, or offset impacts to matters protected under the controlling provisions of this approval within a designated timeframe. The Minister may require the plan be prepared or reviewed by a suitably qualified person or another person specified or agreed to by the Minister. If the Minister approves the plan then the approved plan must be implemented.

This SMP satisfies requirements of the Outcomes Strategy (EPBC Approval) and Significant Species Management Plan (SPA Approval) by providing '***design, construction and operations impact avoidance and mitigation measures and protocols'*** for the Northern Quoll.

3.0 Assessment

3.1 Applicable Species

This SMP applies only to the Northern Quoll (*Dasyurus hallucatus*), that has been confirmed to be present within the project footprint and surrounding areas. The Northern Quoll was determined to present on site from baseline and targeted field surveys undertaken for the MEWF project (RPS, 2013). For the management of general native species during the lifetime of the MEWF project, a *Habitat Clearing and Management Plan* (RPS, 2016) has been prepared.

3.2 Ecology of the Northern Quoll in Far North Queensland

Size: 200-310mm (hb). The males weigh up to 1kg and females up to 500g typically.

Plate 1 Northern Quoll

Identification: The species is grey brown to brown above with large white spots on its body and sometimes on the base of the tail. The underbelly is cream. The nose is pointy with large prominent ears and eyes. Individuals will hiss when disturbed.

Abundance: The population of Northern Quolls on site is estimated to be in the order of 53 individuals or 0.5% of the total metapopulation estimate for the region (Burnett *et al* 2013). This population estimate was determined through a "population density" approach and was supported by a "closed population capture/recapture" approach which also provided the same population estimate across the site. The population density research included an estimate of 1.09 Quolls/100ha in flat or near flat suitable habitat and of 2.25 Quolls/100ha in moderately to extremely rugged, suitable habitat (Burnett, 2013).

Distribution: The Mount Emerald Northern Quoll population forms a part of the greater Far North Queensland Northern Quoll metapopulation, which ranges from around Ravenshoe in the south to Cooktown in the north. This is one of ten known Northern Quoll metapopulations that occur across Australia, and one of six metapopulations within Queensland (RPS, 2013)

Habitat: Found in rocky Eucalypt woodland, however, has been located in variety of habitats including rainforest, shrubland, grassland and desert. On the MEWF site individuals have been known to utilise ridgeline and creek habitats for denning.

Diet and Foraging: The species is an opportunistic omnivore and is known to prey on small mammals, reptiles, arthropods and fruit.

Behaviour: The species is nocturnal and they are known to den in tree hollows and rock crevices. Animals appear to have extensive home ranges and may travel several kilometres in one night.

Reproduction: The species breeds once a year with birthing occurring in the mid dry season, with all males dying after mating. Females typically live two mating seasons. Juveniles have a high chance of survival while in the pouch, however, once they leave the pouch and are left in the den while the mother forages (at the age of around 8 weeks) this drops significantly. Juveniles are weaned at 6 months old (DotE, 2016).

3.3 Site Assessment

Extensive field surveys and modelling has occurred since 2012 to assess potential impacts on the Northern Quoll including:

- Camera trapping;
- Elliott and cage trapping, collaring, automated and hand held radio tracking;
- Local and Regional Genetic Diversity Assessment; and
- Population Viability Analysis.

The Northern Quoll population on the proposed MEWF site may be important in maintaining the viability of the Far North Queensland (FNQ) metapopulation of the species, which is one of the most secure of the Australian metapopulations (i.e. Pilbara, Kimberleys, Darwin/Kakadu, Cape York, Carnarvon Gorge, Townsville, Mackay/Rockhampton and SE Queensland) due to its persistence despite the presence of Cane Toads. Population viability analysis models (albeit highly conservative) indicate the Mt Emerald Northern Quoll population is at risk of extinction over the proposed lifespan of the project (25 years) and even small levels of mortality associated with the project could impact the viability of the local population.

Research suggests the Mt Emerald population is <1% of the total estimated FNQ metapopulation and with only 58ha of the total 2,422ha of habitat on the property to be disturbed risks are considered to be very low. However, further studies are required in order to be able to assess the likely significance of these potential impacts on the overall FNQ metapopulation (Burnett, 2013).

Ongoing research into the size, occupancy and demographic characteristics of the Northern Quoll population on the MEWF project site will continue over the next three years.

Radio-telemetry studies on Mt Emerald suggest non-breeding season den site habitat is likely to be widespread across the site. However, only limited information is available on the maternal den site habitat availability; with data obtained to date indicating ridge habitat where turbines are proposed to be located may be critical. Whilst the narrow ridgelines are dominated by rocky habitat, it is also prevalent along creek lines and as outcrops in mid slope areas, therefore it is considered likely that suitable maternal denning habitat may not be restricted to ridgelines only.

The most recent studies (RPS, 2015) have confirmed that VHF radio collars are adequate to determine the locations of day-time dens and therefore are clearly a useful and effective mitigation tool to ensure animals would not be in the clearance/disturbance zone during development. The study re-confirmed that Northern Quolls can be reliably trapped in order to identify den sites and deploy and recover collars.

3.4 Potential Impacts

A variety of activities conducted during construction and operation of the MEWF Project have the potential to directly or indirectly affect this species and its habitat.

3.4.1 Construction

3.4.1.1 Direct Mortality during Clearing, Excavating and Blasting Operations

There is the potential for some individual Northern Quoll present within their day time den sites to be killed by crushing during the construction phase, when habitat is being cleared or during civil works. This impact may be particularly significant if females are preferentially utilising ridge habitats for maternity denning.

3.4.1.2 Noise, Dust & Vibration Disturbance

Noise is an environmental stressor and can potentially affect wild animals in a number of ways including: alienation from noisy habitats, hearing loss, increased rates of predation or reduction in foraging success due to masking (i.e. interference with the perception of sounds of interest), physiological stress and associated adverse health effects, increases in energetic expenditure due to startling etc (see references in Kerlinger *et al*., 1995). It is not well understood how the Northern Quoll is likely to respond to disturbance associated with construction activities. Although the Northern Quoll display some tolerance to human activities, being known to inhabit human dwellings in the vicinity of the site (Luke Jackson, *pers. com*.), they are not typically exposed to the levels of disturbance likely to be experienced during construction of the wind farm. The majority of the site will not be impacted by the development and the development will occur in stages that will be of minimal impact to breeding stages of the species.

3.4.1.3 Habitat Loss

There is the potential for the loss of approximately 58 ha of foraging and denning habitat due to the proposed infrastructure footprint. Given the abundance of potentially suitable fallen and standing (live or dead) hollow eucalypts and rocky outcrops as denning microhabitats across the site, it is not likely the loss of 58ha of potential habitat will significantly impact the local population.

3.4.1.4 Habitat Degradation

Invasion of Introduced Pasture Grasses – The introduction of exotic pasture grasses in the Northern Territory disadvantages Northern Quoll by inhibiting movement and hunting ability through high density stands of exotic pastures and also fosters more intense fire regimes (Hill & Ward 2010).

The use of stringent machinery weed hygiene protocols on site and frequent and comprehensive weed monitoring and control actions, will reduce the likelihood of potentially highly invasive introduced grasses from spreading. Introduced grasses already established within small areas along access tracks and creek crossings within the site, includes Grader grass (*Themeda quadrivalvus*), Thatch grass (*Hyparrhenia rufa*) and Pigeon grasses (*Setaria spp.*).

Inappropriate fire regime - The frequency, season and intensity of fires are all likely to be important factors affecting Northern Quoll populations (Hill & Ward, 2009). Hill & Ward (2009) suggest the decline of the Northern Quoll may be related to increased vulnerability of individuals to predation following the removal of ground cover vegetation by fire, particularly in areas without extensive rocky outcrops.

The use of strict weed hygiene, monitoring and control management actions will prevent the likelihood of invasive pasture grasses becoming more widely established on the project site. If these grasses become well

established across the site, they are likely to contribute to a more intense fire regime which could pose a serious threat to the viability of the local Northern Quoll population.

3.4.2 Operation Phase

3.4.2.1 Disturbance resulting in exclusion and changes in utilisation patterns

Noise – Noise studies conducted by RATCH show existing background noise on the site can vary with wind speed, ranging from 30dBA to 60dBA across the operating range of the wind turbines. Therefore it is unlikely operational turbines noise will influence the behaviour of the Northern Quoll outside the range in which it currently survives in its predatory niche. The majority of the site will not be impacted by the development and construction will occur in stages that will be of minimal impact to breeding stages of the species. The species also displays some tolerance to human activities, being known to inhabit human dwellings in the vicinity of the site.

Vehicular Collision - A study by Oakwood (2000) of Northern Quolls in Kakadu National Park suggests road mortality is a frequent occurrence with this species and appears to be biased towards males, with six times as many males as females hit by cars. Oakwood (2000) also concluded increased frequency of road mortality in Northern Quolls corresponds highly with the breeding season (May-October).

There is the potential for some Northern Quoll individuals to be directly killed due to vehicular collisions during the night and day; although a vehicle speed limit (40km/h) will be enforced throughout construction and operation.

Mitigation measures as described in **Section 5** of this SMP; have been designed to minimise direct impacts such that they are unlikely to be significant.

4.0 Responsibilities

4.1 Roles and Responsibilities

The roles and responsibilities of important personnel are detailed in **Table 2** below.

Table 2 Roles and Responsibilities of Important Personnel

Position	Roles	Contact Details
MEWF	Owner, responsible for ensuring approval conditions are met.	Terry Johannesen Level 4, 231 George Street BRISBANE QLD 4000 T: +61 7 3214 3401
Environmental Officer	The site Environment Officer(s) is responsible for ensuring all monitoring and auditing, and corrective actions are undertaken as outlined in **Section 4.5.**	
Fauna Ecologist	An experienced Fauna Ecologists will be responsible for implementation of the survey and relocation activities on behalf of MEWF and the Contractor. This person will have ultimate responsibility for suspending or ceasing works in the event criteria are not met (e.g. decision on cessation of works if deleterious impacts on welfare of Northern Quoll identified). They will be responsible for reporting to administering authorities such as the Department of the Environment (DotE) and Department of Environment and Heritage Protection (DEHP) as required. It will be their responsibility to ensure that all requirements of this plan and applicable permits/legislation are met.	RPS Mellissa Jess 135 Abbott Street Cairns 07 4031 1336 0447 171 417
Spotter Catcher	The spotter catchers undertaking the spotter catcher works during clearing activities will be DEHP registered and will be responsible for carrying out the spotter catcher activities during tree removal activities as per the requirements of this plan and the *MEWF Habitat Clearing and Management Plan* (RPS 2016).	Jeff Middleton M: 0419 345 559 Dave Walton M: 0408 331 700
Wildlife Carer/Vet	Wildlife Carers will be engaged to assist in the care of any Northern Quoll that may become injured either directly or indirectly throughout any relocation. A vet will be briefed and made available for treatment of injured Northern Quoll if they are encountered.	QPWS Level 3, Building 2 William McCormack Place 5B Sheridan Street Cairns Qld 4870 (07) 4222 5303 Mareeba Veterinarian 149 Walsh Street T: 07 4092 4260 Tablelands Wildlife Rescue 24 Hour Emergency Hotline T: 07 4091 7767
Other Parties	All parties will have responsibilities to ensure the welfare of Northern Quoll population is maintained throughout the works. All parties will be inducted on identification of the Northern Quoll and who to contact in the event one is identified in the works site.	

4.1.2 Survey Personnel

To ensure the monitoring and the data collected is undertaken in an accurate and robust manner, representatives must have demonstrated ability in all aspects in which they are to be engaged and possess all relevant licences before the commencement of works. This includes spotter catcher licence and ethics approvals.

4.1.3 Training and Awareness

All site personnel and contractors must undertake a site specific environmental induction prior to commencing works on the MEWF project. The environmental induction shall provide information to enable staff to recognise and respond to signs of current Northern Quoll activity.

5.0 Management Actions

A number of management measures have been developed to mitigate potential impacts on Northern Quoll habitat, Northern Quolls within the project area and adjoining areas throughout construction and operation. This SMP is to be used in conjunction with the *MEWF Habitat Clearing and Management Plan* (RPS, 2016).

5.1 Pre Construction Management

5.1.1 Pre Works Surveys

- Conduct intensive pre-construction live-trapping surveys in the vicinity of the planned infrastructure areas, beginning when Northern Quoll are likely to be large enough to be fitted tracking collars. This will allow for the location of denning sites, including maternal sites which can be checked for occupation immediately prior to ground disturbance.
  - » Three days prior to the commencement of primary bulk earthworks (including initial ground breaking and trenching using dozers, rock breakers etc) in discrete clearly marked areas, establish live-trapping line traps immediately outside of the infrastructure area. Wire cage traps will be set up 150m apart and 5-10m in from the track edge, and baited with chicken necks in sections. Each trap will be flagged with pink marking tape and a GPS point. These coordinates will be provided to the Environmental Officer. Traps are to be checked between sunrise and 9 am, then closed for the day and set in the late afternoon. Each trap will be covered with protective cloth to shield it from the elements. Traps will be open for three consecutive nights.
  - » Before construction starts, traps are to be checked at dawn and all captured animals (with the exception of females with young deposited in maternity den sites – see below) to be relocated to suitable refugial areas (e.g. rocky outcrops) at least 1000m away from the construction area. Trapping and relocation will be continued for the duration of construction. All trapped Northern Quoll individuals will be fitted with light-weight tracking collars.

5.1.2 During Works

- In addition to live-trapping, the proposed clearance footprint will be searched methodically for denning individuals each morning prior to starting construction activities. Search techniques may include manual or visual inspection, radio-tracking or use of sniffer dogs. If any actively occupied dens are located within the construction area, then all bulk earthworks will be halted until such time as the individual shifts den sites.
- When dependent young are deposited by the female Northern Quoll in a maternity den, as opposed to being carried around in the pouch, they will be impossible to capture in live traps. Oakwood (1997) found young were deposited in maternal dens in mid to late-August and were not trappable until at least November each year. It is not known whether the timing of this will vary significantly each year; therefore, ongoing live-trapping to monitor female reproductive status will need to be undertaken to determine when young are deposited in maternal dens and when they are independent and relocatable.
- Primary bulk earthworks will need to be conducted in discrete, clearly marked sections on a sequential basis. The size of each discrete construction area would be limited to that able to be trapped and searched for collared animals in the 1-2 hours around dawn each day. Best practice mitigation options as described in the *Referral Guidelines for the Northern Quoll* (DotE, 2011) strongly recommend all construction activities that involve the use of heavy machinery or blasting should be avoided during the breeding season (i.e. typically May-November, but the exact timing of breeding varies across the range of the species). If this recommendation is followed, it would only leave five months of the year available for primary earthworks. Limiting the use of heavy machinery to the non-breeding season months is not considered to be an economically feasible option and therefore trapping and relocation of individuals, and exclusion from breeding dens is the preferred strategy.

- If adult females are captured during the preconstruction live-trapping and inspection indicates they have dependent young that are not in the pouch (i.e. lactating nipples), then the female will be released immediately at the point of capture rather than being relocated, and then tracked to the day-time maternity den. Construction will be halted within a buffer distance (to be determined) until live-trapping monitoring indicates that young are trappable, the female vacates the den with the dependant young or fibre optic camera monitoring of maternal behaviour indicates that disturbance is at tolerable levels.
- Preliminary investigation of the use of two specially trained Quoll detection dogs and handlers in October 2013 was successful in identifying areas of the site utilised by Northern Quoll At the time of the detection dog trial, no Northern Quolls were fitted with radio-collars. This survey was only the second actual field trial of the dogs and at the time, it was not possible to differentiate between Northern Quoll scent and actual inhabited den sites. However, ongoing field testing of the sniffer dogs throughout the Australia distribution of the species indicates that the trained Quoll sniffer dogs are capable of discriminating between scats/scent and live animals within daytime dens (Amanda and Lloyd Hancock, Sadler Springs Education Centre, pers. com.). Further investigation of the potential for using detection dogs to identify inhabited den sites is warranted as it may enable construction activities to be continued into the period when dependent young are deposited in maternity dens and when they are independent (mid-late August to November). The use of Quoll detection dogs together with radio-telemetry would increases the likelihood that all animals denning in each construction area is free of Northern Quoll in den sites.
- All site personnel and contractors shall report any evidence of dens, regardless of whether or not the person suspects the den to belong to a Northern Quoll, to the Environmental Officer who will inform the Project Manager. The Environmental Officer shall establish a 20 metre exclusion zone around the den. The Environmental Officer shall notify all site personnel and contractors of the exclusion zone and the restriction on works surrounding this area;
- The exclusion zone shall remain in place until the den has been inspected by a *suitably qualified and experienced person* and confirmed the den is not being utilised by Northern Quoll or other threatened species of fauna. This may include the use of track monitoring pads and/or camera traps to detect current activity;
- If the den is being utilised by a least concern species, the animal may be removed and relocated by a licensed wildlife carer or spotter-catcher in accordance with the *MEWF Habitat Clearing and Management Plan* (RPS, 2016) relating to tampering with animal breeding places of least concern species;
- If the den is confirmed to be used by Northern Quoll or other threatened species, the Environmental Officer shall liaise with the Ecologist to relocate animals.
- No domestic pets are allowed on the site **at any time** during construction or operation.
- Records should be kept of the date surveyed, whether any evidence of the activity was observed and actions taken to prevent harm to any animals and their habitat and per **Section 6.1.1** of this SMP.

5.1.3 Clearing Strategies

- A licensed and experienced spotter catcher(s) will be onsite during all clearing activities and will ensure any injured animals are given to an appropriate wildlife carer group or vet, DotE and DEHP will be notified within 24 hours of any native animal injuries or deaths.
- All clearing activities must be completed under the *MEWF Habitat Clearing and Management Plan* (RPS 2016) for the MEWF project site.
- The following practices will be followed for open trenches:

  (a) Surveillance of the open trench in all areas and the removal of wildlife from the trench by appropriately trained personnel will be undertaken (the whole trench length will be checked at least twice a day (early morning/late afternoon);

  (b) Minimise the period of time the trench is open, particularly in any identified important habitat areas,

(c) Backfilling of trenching will be preceded by visual inspection to identify and remove trapped wildlife.

(d) Formed slopes or plugs, branches, hessian sacks, ramped gangplanks or similar will be used to create 'ladders' to enable fauna to exit the trench. Where trenches are to be left open for prolonged periods (overnight or longer), these structures will be placed every 50 to 100m, depending on the surrounding landscapes.

5.2 Operations

- Traffic levels will be maintained and controlled on site, where traffic will be limited during night hours to minimise fragmentation and mortality of Northern Quoll;
- Ensure no entry into conservation areas by the implementation of signage (except for necessary environmental management and monitoring);
- Avoid and enforce unauthorised off track driving through the implementation of signage and penalties;
- Reduce and enforce speed limits in the vicinity of Quoll habitat through the implementation of signage and penalties.
- Report and record road kills.
- Implement quarantine protocols, as detailed in the Northern Quoll Recovery Plan (2007) to prevent the spread of weed species into the MEWF project area, including:
  - Installation of a wash down facility. The wash down facility should comprise high pressure water and steam devices;
  - Development and facilitation of educational programs for staff and contractors about quarantine protocols and associated risks involved with invasive weed species;
  - Implementation a no fill policy for the life of the project e.g. no introduction of material from off-site such as soil or vegetation.
  - Control and eradication (where possible) of weeds with a high priority for habitat-modifying weeds;
  - Remove and spray high priority weeds; and
  - Manage fuel loads of weeds to reduce risk of high fire intensity.

5.3 Contingency Planning

In the event of unexpected impacts on other protected wildlife, the following process is to be followed:

- Sick, injured or orphaned native animals located during clearing activities are to be reported to the Queensland Parks and Wildlife service by phoning (07) 4222 5303 and appropriate arrangements made.
- Evidence of injury or death of fauna resulting from construction activities will be reported to the Contractor's Environmental Officer immediately for investigation and action if necessary.
- Should additional species listed under the provisions of the NC Act or EPBC Act be identified during the construction of the Project, then the relevant approvals should be sought before works recommence in the relevant area and management actions adapted accordingly to address the species concerned.
- DEHP are to be notified if any Northern Quoll are injured. The Contractor's Environmental Officer or other relevant site personnel are to contact the Wildlife Ranger at the Cairns Office, or alternatively the DEHP hotline on 137 468 if outside of normal business hours.

6.0 Monitoring and Reporting

The Contractor's Environmental Officer is to:

- Check on a daily basis during construction that vegetation to be cleared is clearly delineated (i.e. 'no go' zones are clearly demarcated and/or barricaded).
- Ensure vegetation clearing is being undertaken in accordance with 'Construction Strategies' listed above (e.g. pre-clearing surveys, requirement for licensed fauna spotter-catcher).
- Ensure on a daily basis that contractors are clearing vegetation in accordance with the Project environmental management plans and monitor for unauthorised works beyond the extent of clearing barriers. During construction, record any discernible evidence of listed threatened or iconic species activity, which would require the presence of a spotter-catcher to relocate.

6.1.1 Records

The following records shall be kept for the duration of construction and for at least five years after activities have ceased at the MEWF project site:

Records shall be kept of all inspections undertaken in accordance with this SMP, including the following information.

- Date of inspection;
- Name and qualifications of person conducting the inspection;
- Results of inspection (description of area surveyed, type of works activity proposed in area, number and location (GPS coordinates) of dens found, individual identification (sex, status, dependent young recurring presence);
- Control measures / exclusion fencing put in place;
- Persons notified (e.g. Environmental Officer, Project Manager, QPWS, and DEHP);
- Any unauthorised damage to dens shall be reported as an Environmental Incident; and
- Any harm to threatened species, in particular Northern Quoll that occurs during works shall be reported to DEHP and DotE within 24 hours of the incident and no works shall commence on site until approval to proceed has been obtained from DEHP.

6.1.2 Review

- Third party audits of the Northern Quoll SMP is to take place at least four times a year for the duration of the construction of the MEWF project, then yearly once the MEWF project is in operation. These audits are to be arranged by the Contractor's Environmental Officer.
- Should findings from research identified in the MEWF Outcomes Strategy (Burnett, 2016) become available and useful to this SMP, this SMP will be updated accordingly to reflect the new information.

7.0 Definitions

Animal Breeding Place:	A bower, burrow, cave, hollow, nest or other thing that is commonly used by the animal to incubate or rear the animal's offspring.
Licensed Wildlife Carer	A person qualified to take and keep protected wildlife under a current rehabilitation permit in accordance with the Nature *Conservation (Administration) Regulation 2006*.
Suitably Qualified and Experienced Person	▪ A person with formal qualifications and/or experience in fauna identification and life ecology and environmental management. A person is considered to be suitably qualified and experienced if they meet one or more of the following criteria: ▪ An ecological consultant with experience in conducting fauna surveys; ▪ A person who possesses a degree in natural science or similar with experience in conducting fauna surveys; ▪ A person who is a *spotter-catcher* under a rehabilitation permit issued under the NCA; or A person who can demonstrate significant experience in the removal of trees and spotting for wildlife to ensure they are not harmed during vegetation clearing.
Spotter-Catcher	A person qualified to take and keep protected wildlife under a current rehabilitation permit extended to authorise the take, keep or use of an animal who's habitat is about to be destroyed by human activity in accordance with the *Nature Conservation (Administration) Regulation 2006*.
Tamper	Tamper with an animal breeding place, means damage, destroy, mark, move or dig up the breeding place.
Take	Includes: In relation to an animal: (i) Hunt, shoot, wound, kill, skin, poison, net, snare, spear, trap, catch, dredge for, bring ashore or abroad a boat, pursue, lure, injure or harm the animal; or (ii) Attempt to do an act mentioned in subparagraph (i).

8.0 References

Burnett, S. (1997). Colonizing cane toads cause population declines in native predators: reliable anecdotal information and management implications. *Pacific Conservation Biology*, *3*(1), 65.

Burnett, S. and Marsh, H. (2004) Conservation of the Spotted-tailed Quoll, *Dasyurus maculatus*: a conceptual and applied model with particular reference to populations of the endangered *D. m. gracilis*. Pp. 624-638 In *Conservation of Australia's Forest Fauna (second edition).* Ed. D. Lunney. Royal Zoological Society of New South Wales, Mosman, NSW.

Burnett, S., & Holmes, B. (2008). The spotted-tailed quoll *Dasyurus maculatus* in Queensland's Border Ranges area.

Burnett, S Shimizu Y and Middleton J (2013) Distribution and abundance of the Northern Quoll (*Dasyurus hallucatus*) in far North Queensland. Prepared for RATCH Australia Pty Ltd, Brisbane.

Department of the Environment (2016) http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=331

Environmental Heritage Protection Council (EPHC) (2010). *Draft National Wind Farm Development Guidelines.*

Hill, B. M., & Ward, S. J. (2010). *National recovery plan for the northern quoll Dasyurus hallucatus.* Department of Natural Resources, Environment, The Arts and Sport, Darwin.

James Cook University (JCU) (2011). *When The Dingoes Are Away, The Cats Can Play*. http://www-public.jcu.edu.au/news/current/JCU_112827. Accessed Wed, 27 Nov 2013 13:56:10 +1100.

Kerlinger, P., Burger, J., Cordell, H. K., Decker, D. J., Cole, D. N., Landres, P., & Anderson, S. (1995). *Wildlife and Recreationists: Coexistence Through Management And Research*. R. L. Knight, & K. Gutzwiller (Eds.). Island Press.

King, D. R. (1989). An Assessment of the Hazard Posed to Northern Quolls (*Dasyurus-hallucatus*) by Aerial Baiting With 1080 to Control Dingoes. *Wildlife Research*, 16(5), 569-574.

Lawrence A. Rabin, Richard G. Coss, Donald H. Owings, The effects of wind turbines on antipredator behavior in California ground squirrels (Spermophilus beecheyi), Biological Conservation, Volume 131, Issue 3, August 2006, Pages 410-420

Lichtenhan, Jeffery, and Alec Salt. "Amplitude modulation of audible sounds by non-audible sounds: Understanding the effects of wind turbine noise."Proceedings of Meetings on Acoustics. Vol. 19. No. 1. Acoustical Society of America, 2013.

Morris, K.D., Johnson, B. and York, M. (2005). *The impact of using Probaits for fox control on chuditch (Dasyurus geoffroii) in the wild: final report*. Department of Conservation and Land Management, Kensington, WA. pp. 8.

Oakwood, M. (1997). *The Ecology of the Northern Quoll* .PhD thesis, Australian National University.

Oakwood, M. (2000) Reproduction and demography of the northern quoll, *Dasyurus hallucatus* in the lowland savanna of northern Australia, *Australian Journal of Zoology*, 48(5): 519-539

Oakwood, Meri and Pritchard, David (1999) . Little evidence of toxoplasmosis in a declining species, the northern quoll (*Dasyurus hallucatus*). *Wildlife Research* **26** , 329–333.

Parris, Kirsten M., and Angela Schneider. "Impacts of traffic noise and traffic volume on birds of roadside habitats." *Ecology and Society* 14.1 (2009): 29.

Reside, April Elizabeth (2011) *Assessing climate change vulnerability: novel methods for understanding potential impacts on Australian tropical savanna birds.* PhD thesis, James Cook University.

Reside, April E., Vanderwal, Jeremy, and Kutt, Alex S. (2012) Projected changes in distributions of Australian tropical savanna birds under climate change using three dispersal scenarios. Ecology and Evolution, 2 (4). 705 -718.

RPS (2011). Preliminary Fauna, Vegetation & Flora Assessment - Proposed Mt Emerald Wind Farm. Report prepared by RPS Group for Transfield Services Pty Ltd.

RPS Australia East and RATCH Australia Pty Ltd (2013) *Mount Emerald Wind Farm Environmental Impact Statement.* Prepared for RATCH Australia Pty Ltd Brisbane

RPS Australia East (2015) *Northern Quoll Utilisation Study on the Proposed Mt Emerald Wind Farm Site Using Lightweight GPS Collars*. Report prepared for RATCH Australia Pty Ltd, Brisbane.

USQ and RPS (2016) *Mount Emerald Wild Farm Northern Quoll Outcomes Strategy*. Prepared for RATCH Australia Pty Ltd, Brisbane.

Slabbekoorn, H. & Ripmeester, E.A.P. (2008) Birdsong and anthropogenic noise: implications and applications for conservation.*Molecular Ecology*, **17**, 72–83.

Woinarski, J., Rankmore, B., Fisher, A., Brennan, K., & Milne, D. (2007). The natural occurrence of northern quolls *Dasyurus hallucatus* on islands of the Northern Territory: assessment of refuges from the threat posed by cane toads Bufo marinus. *Report to Natural Heritage Trust*.

Woinarski, J. C. Z., Oakwood, M., Winter, J., Burnett, S., Milne, D., Foster, P.,& Holmes, B. (2008). Surviving the toads: patterns of persistence of the northern quoll *Dasyurus hallucatus* in Queensland. *Report to The Australian Government's Natural Heritage Trust.*