

Solar Site 2 Mining Management Plan 2024

13 June 2024

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1 Introduction

Gove Operations is located on the Gove Peninsula in North-East Arnhem land in the Northern Territory (NT), 650 kilometres (km) east of Darwin. Gove Operations commenced bauxite mining in the 1970s to supply the export market and a local alumina refinery. The operation includes four functional areas, mine production, refinery, Residue Disposal Area (RDA) and marine, based on the land use, operational status and geographic location. The mine is operated by RTA Gove Pty Ltd.

The Gove Operations operate on Special Mineral Lease (SML 11, Part 1, 2 and 3) which is held by Swiss Aluminium Australia Limited (SAAL) and covers the mine, refinery and conveyor. In addition to SML11, SAAL was also issued with a range of Special Purposes Leases (SPLs) which cover associated infrastructure that supports Gove Operations including the Nhulunbuy Township and Industrial Estate.

Gove Operations is authorised by Authorisation 0035-02 (Authorisation) and Mining Management Plan, approved in July 2020 (Approved MMP).

The operation and maintenance of power plant and an infrastructure network at Gove Operations is already approved by Gove Operations' Authorisation and MMP. Diesel power generators are located within SML11 Part 3 – Refinery and provide power for Gove Operations as well as the local communities including Nhulunbuy, Yirrkala, Gunyangara and other local users.

To align with Rio Tinto's emission reduction targets, RTA Gove Pty Ltd, as agent for and on behalf of Swiss Aluminium Australia Limited, has entered into a fixed term Power Purchase Agreement (PPA) with Aggreko Generator Rentals Pty Ltd (Aggreko). Pursuant to the PPA, Aggreko will construct, install and operate two solar farm sites consisting of 5.25MW (10.5MW generation total) of solar in conjunction with the existing diesel generation, to support the existing power supply. It is anticipated that there will be an overall 19% reduction in CO₂ emissions per year under this new arrangement. This initiative will also contribute towards the targets set by the NT Government in their Northern Territory Climate Change Response: Towards 2050 report.

The PPA has a term of 10 years. At the end of the term, there is the ability for the solar farms to continue to operate into the future.

One of the solar farm sites will be located within SML 11 Part 1 at the location shown in **Figure 1** (Solar Site 2). Solar Site 2 covers 14.4 ha with an additional 1.7 ha corridor to access the 22kV Town Feeder and is located approximately 10km southeast from the town of Nhulunbuy.

See **Attachment A** for an overview of the Solar Site 2 area and **Attachment B** for the Solar Site 2 layout.

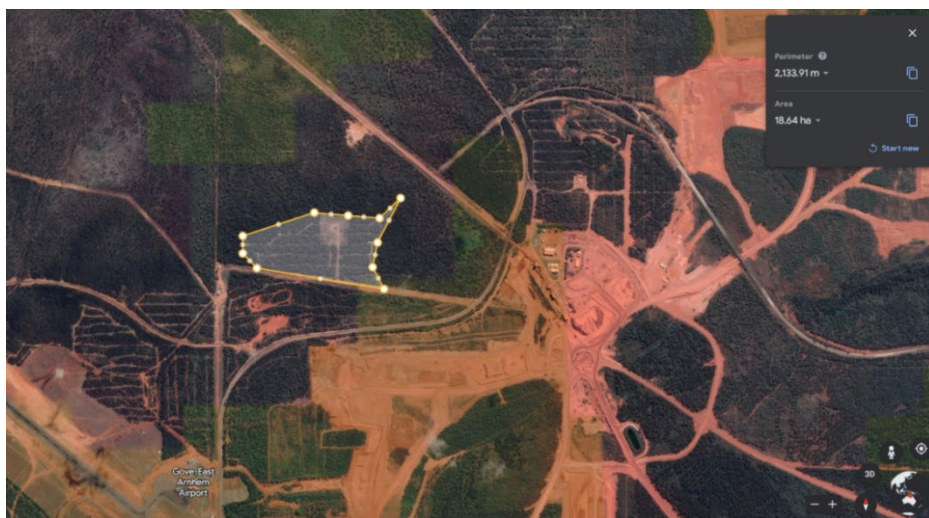


Figure 1. Location of Solar Site 2

The site was selected as a suitable location for the solar farm as it is previously disturbed land within SML 11, it is relatively close to existing high voltage electrical infrastructure and fits the required footprint. The site was previously used by the European Launcher Development Organisation (ELDO) and has also been drilled and found to have no economic value for mining (See **Section 5**).

Solar Site 2 sits on the traditional lands of the Gumatj people. The Gumatj were consulted on the site selection and support the location of this site.

This Mining Management Plan (MMP) is to support the separate authorisation for the mining activities associated with Solar Site 2. This MMP also describes the closure pathway, in the event that the stakeholders decide in the future that the solar farm site will cease to operate. To the extent possible, Solar Site 2 is to be rehabilitated to form a final landscape that is aesthetically compatible with the surrounding natural landscape or supports an agreed alternative land use.

1.1 Intent of Mining Management Plan

This MMP is to support the separate authorisation for the mining activities associated with Solar Site 2. The intent of this MMP is to, in accordance with the Mining Management Act 2001 (MM Act):

- Detail the mining interest held for Solar Site 2 including ownership;
- Describe the Solar Site 2 activities being undertaken for which RTA Gove requires the Authorisation;
- Detail the organisational structure of the Operator carrying out the project;
- Detail the Operators' management system;
- Assess the environmental impact of the Solar Site 2 activities;
- Establish agreed closure objectives, criteria and indicators to construct a final landform that supports the agreed final land use, in accordance with acceptable environmental and social standards.

The MMP is intended to commence immediately upon approval.

2 Operator Information

2.1 Ownership of Mining Interests

RTA Gove Pty Ltd (ABN 76 000 456 663) (RTA Gove) is submitting this MMP in its capacity as Operator of the Gove Operations pursuant to section 10 of the MM Act and the agent of Swiss Aluminium Australia Limited for the purposes of the energy arrangements with Aggreko. RTA Gove is a subsidiary of Swiss Aluminium Australia Limited (ACN 008 589 099) (SAAL), which holds the Mining Lease. Both SAAL and RTA Gove are wholly owned subsidiaries of the Rio Tinto Group. The Operator details and key contacts are listed in **Table 1**.

RTA Gove is the Operator for the purposes of this Authority, and will retain ultimate management of the site in accordance with the management structure outlined below. RTA Gove has contracted the construction, installation, operation and maintenance of the solar farms to Aggreko as per the PPA. SAAL (as the mining lease holder) will licence the Solar Site 2 site to Aggreko for the term of the PPA in order for Aggreko to operate the solar farm. It will be a condition of the licence that Aggreko comply with Gove Operations approvals.

Table 1. Gove Operations Operator Details and Contacts

Details	
Operator	RTA Gove Pty Limited (ABN 76 000 453 663)
Owner	Swiss Aluminium Australia Limited (ACN 008 589 099)
Operator Registered Address	155 Charlotte Street, Brisbane QLD 4000
Operator Postal Address	PO Box 21, Nhulunbuy NT 0881
Operator Street Address	Melville Bay Road, Nhulunbuy NT 0880
Contacts	
Operations General Manager	Steven Dunstone Phone: +61 (0) 8 9147 5250 Email: Steven.Dunstone@riotinto.com
Health, Safety & Environment (HSE) Business Partner	Brad Warner: Phone: +61 (0) 8 8987 5233 Email: Bradley.Warner@riotinto.com
Closure General Manager	James Low: Phone: +61 (0) 448 477 867 Email: James.Low@riotinto.com
Superintendent – Utilities	Steve Moratti Phone: +61 (0) 8 8987 5972 Email: Steve.Moratti@riotinto.com

The structure of the Gove Operations Environment Department is shown in **Table 2**. The HSE Department, including the Environment Department, have overall accountability of HSE performance and compliance of activities undertaken by Aggreko on the Solar 2 site.

Table 2. Gove Operations Environment Department

Position Title	Name	Area of Accountability
HSE Business Partner	Brad Warner	Accountable for the delivery of HSE Plans and provision of HSE support across the Gove Operations and the Solar Sites.
Superintendent Environment (Operations)	Andrew Carmichael	Accountable for the delivery of the overall Gove operations Environmental Plan and provision of environmental support across the business. Accountable for a team of Environmental Advisors & Technicians who conduct all environmental monitoring across site, this includes monitoring of the overall compliance of the solar farms.
Specialist - Rehabilitation	Faye Lawton	Accountable for the delivery of rehabilitation and research programmes.

The Aggreko project team report to the RTA Gove Superintendent – Utilities who oversees and supervises the Aggreko contractors. The Superintendent – Utilities falls under the management of the RTA Gove Operations General Manager via the reporting structure in **Table 3**. Superintendent – Utilities is the Contractor Supervisor for Aggreko and will act as the site contact to the Department, for the purposes of the MM Act. The structure of Aggreko's project team is shown in **Table 4**.

RTA Capital Projects reports to the Superintendent Utilities/Contractor Supervisor during initial site preparations works. **Attachment H** – RTA Gove Solar Site 2 Construction and Environmental Management Plan (CEMP) is applicable to these initial site preparation works required to be undertaken, prior to Aggreko commencing solar farm construction and operation of the site. Initial site preparation works include the site clearing, fencing of the external boundary of the site, the construction of all-weather access roads and the electrical tie in.

Table 3. RTA Gove Personnel to oversee Contractors

Position Title	Name	Area of Accountability
Operations General Manager	Steven Dunstone	Accountable for the overall RTA Gove Operations, including management of the solar Farm.
Fixed Plant Operations General Manager	Will Collins	Accountable for the management of RTA Gove's Fixed Plant Operations, including management of the solar Farm.
Superintendent – Utilities	Steve Moratti	Accountable for the management of RTA Gove's utilities network including Power and Water. The Aggreko project team report to the RTA Gove Superintendent – Utilities who oversees and supervises the Aggreko contractors during construction and operation of the solar farm.
Superintendent – RTA Capital Projects	Sonia Campbell	Accountable for the delivery of initial site preparation works including site clearing, fencing of the external boundary of the site, the construction of all-weather access roads and the electrical tie-in. The Superintendent - RTA Capital Projects reports to the Superintendent Utilities/Contractor Supervisor during the site preparation works and will oversee the early works civil contractors.

Table 4. Aggreko Project Team Key Personnel

Position Title	Name
Project Owner	Adam Hentschel
Project Manager	Matthew Lanigan
Project Engineer/Site Operations	Sam Nicholas Peter Shaw
QHSE Manager	David Richard
Area Operations Manager	Alexander Parco

2.2 Mining Interests

The Gove Operations were established pursuant to the Mining (Gove Peninsula Nabalco Agreement) Ordinance 1968. Under this Ordinance, SAAL and Gove Aluminium Ltd (GAL) were authorised to develop and operate the Gove Operation and were issued with a range of tenures for this purpose.

This included Special Mineral Lease (SML 11, Part 1, 2 and 3) which covers the mine, refinery and conveyor (please note that for administrative purposes SML11 was renumbered in 2011 as MLN955). In addition to SML11, SAAL was also issued with a range of Special Purposes Leases (SPLs) which cover associated infrastructure that supports Gove Operations including the Nhulunbuy Township and Industrial Estate.

Following the enactment of the Commonwealth *Aboriginal Land Rights (NT) Act 1976* (ALRA), all of the land underlying SML 11 and the SPLs was identified as 'Aboriginal land' for the purposes of that legislation.

A deed of grant of freehold title to that land has been executed under the ALRA and will be held in escrow by the Northern Land Council (NLC) until such time as SML 11 and the SPLs expire. On expiry, the deed of grant will be delivered, and freehold title in the land will revert, to the Arnhem Land Aboriginal Land Trust (ALALT), who will hold and manage that land on behalf of Traditional Owners.

Solar Site 2 is located on SML 11, Part 1.

Lessor	Lease	General Description	Grant Date	Expiry Date
Currently: Northern Territory of Australia	Mineral Lease (Northern) Number 955 (MLN955)	Special Mineral Lease (SML) 11 (Part 1 Mine, Part 2 Conveyor and Part 3 Refinery)	30 May 1969	29 May 2053

2.3 Compliance Notification Process

Gove Operations will notify the relevant NT Government agencies (DITT, DEPWS, NT EPA and NT Worksafe) of reportable environmental incidents, including the well-being of humans: By telephone or email as soon as practicable; and in writing within 24 hours.

Table 5 details the specific environmental reporting requirements prescribed under legislation.

Table 5. Legal Reporting Requirement for Environmental Incidents

Legislation	Reporting
<i>Mining Management Act</i>	As soon as practicable after the Operator for a mining site becomes aware of the occurrence of a serious accident or critical incident on the site, the Operator must notify the Chief Executive Officer of DITT (or delegate) of the occurrence.
<i>Waste Management and Pollution Control Act</i>	An incident causing or threatening to cause pollution resulting in material or serious environmental harm must be reported to the NT EPA within 24 hours of becoming aware of the incident.
<i>Weed Management Act</i>	To report the presence of a declared weed on occupied land within 14 days of becoming aware of it being present on the land.

<i>Biosecurity Act</i>	As soon as practicable after the Operator becomes aware of a reportable biosecurity incident in relation to goods, the person must, report the incident to a biosecurity officer or the Director of Biosecurity
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2.4 Cultural Heritage

Prior to land disturbance in Gove Operations lease areas a Rio Tinto Archaeologist would undertake an assessment to ensure compliance to our site operating procedure and to ensure compliance to the NT *Aboriginal Sacred Sites Act 1989* and the NT *Heritage Act 2011*. The assessment includes a review of the Gove Operations Cultural Heritage Management Database for any sites located in the disturbance area and whether an archaeological assessment has been undertaken and the issue and relevance of an AAPA Certificate for the disturbance area.

The site database also captures boundaries of AAPA Certificates issued and some sacred sites. The information related to sacred sites cannot be shared and information relating to sites is available from AAPA.

In addition, the TO Agreement has provisions in relation to sacred sites and consulting with Traditional Owners. Consultation with Traditional Owners primarily occurs at the Leaders Forum established under the TO Agreement. Traditional Owners also participate in cultural heritage surveys to determine new disturbance.

No sacred sites are recorded within proximity of Solar Site 2.

3 Mining Activities

The following mining activities will be conducted at Solar Site 2:

- (a) The construction, operation and maintenance of plant (solar farm)
- (b) The solar farm will feed into the network that is used to power Gove Operations and provide ancillary power to the town.

There is no additional extraction or mining being undertaken at Solar Site 2 in connection with the solar farm.

The following works are to be undertaken by Gove Operations:

- Detailed site surveying
- Geotechnical sampling and site review
- Obtainment of all relevant Statutory Compliance permits, approvals, etc
- Site clearing and vegetation removal
- Removal of all redundant site services, cabling and pipes, etc
- Site profiling for the installation of the solar farm
- Provision of all-weather site access and site security fencing
- Installation of high voltage connection to the existing electrical network
- Provision of fibre connection to the site for control and monitoring

RTA Gove, as agent on behalf of SAAL, has contracted Aggreko to construct, install, operate and maintain the solar farm at Solar Site 2. The solar farm consists of solar panels, an automatic solar tracking steel frame structure to mount the panels, cabling systems, HV transformers, inverters on skid support structures and a weather monitoring station. The general layout is shown in **Attachment B**.

Once constructed and commissioned, the activities at the Solar Site 2 shall consist of:

- Site security checks
- Verification of the automatic tracking system
- Clearing of the solar panels when required and minor vegetation control

Solar Site 2 will generate 5.25MW of power to augment the existing diesel power generation.

Power is distributed via 24km of 22kV overhead line from the power station at the port to Nhulunbuy and then to the mine, bore fields and Yirrkala. The 22kV transmission network will be used to conduct the solar generated power from the Solar sites along with the diesel generated power to the areas where it is utilised

via step down transformers reducing the voltage for the town distribution network and other community supplies.

4 Operator Self-Assessment of the Environmental Risk

An operator self-assessment has been conducted to assess potential environmental impacts that the works being undertaken at Solar Site 2 may have. This assessment is detailed in **Table 6**.

An assessment of the likelihood that the described proposed works may have a significant impact on a Matter of National Environmental Significance (MNES) under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) was conducted. The proposed works were also assessed in accordance with the Northern Territory Environmental Protection Authority's (NT EPA) "Pre-referral screening tool" (NT EPA 2022).

Proposals that have the potential to have a significant impact on the environment require referral to the NT EPA in accordance with the Environment Protection Act 2019 (EP Act).

The assessments concluded that it is unlikely the proposed works would have a significant impact on a MNES and does not require referral to the NT EPA under the EP Act based on evaluation for the potential for a significant impact on each of the 14 environmental factors listed in the Screening Tool.

Table 6. Environmental assessment and cultural considerations

Assessment Aspect	YES or NO	Actions Required (if answered YES)	Appended Information
Step 1: Are there any threatened flora and fauna species or habitats of significance that may occur in the proposed work area?	YES	A fauna survey of areas nominated for clearing was undertaken in the 2015 dry season (July to September) and 2016 wet season (January to March). Only one species listed as threatened under the EPBC Act and the Territory Parks and Wildlife Conservation Act 1976 (TPWC Act) was recorded. Gove Operations has a Significant Species Management Plan for the Black-footed Tree-rat (BFTR) which includes an internal assessment decision tree for land clearing applications. A flora survey of areas designated for clearing was undertaken in 2015. No threatened species protected under the EPBC Act and the TPWC Act were detected within the project area.	Refer to Desktop Environmental Assessment for Solar Site 2 in Attachment C. This includes consulted EPBC Protected Matters Search Tool. Consulted NR Maps Biodiversity layers with results appended to this document in Attachment D. Refer to Significant Species Management Plan – BFTR in Attachment E.
Step 2: Are there any known declared weeds within the proposed work area?	YES	A flora survey of areas designated for clearing was undertaken in 2015. The Class B and C weed species <i>Hyptis suaveolens</i> was incidentally recorded within the project area. NT declared weeds are managed as required per the NT Weed Management Act. RT Gove actively monitors and manages weeds onsite through prevention measures such as hygiene and inspection management controls, various weed control &	Refer to Desktop Environmental Assessment for Solar Site 2 in Attachment C. Consulted NR Maps Vegetation layers with results appended to this document in Attachment F. Refer to the RTA Gove Solar Site 2 CEMP in Attachment H.

		eradication measures (physical & chemical), disposal, monitoring and reporting programs.	
Step 3: Will you be using water from bores or other sources for the operation?	YES – other sources	Water used for this project will be sourced from the approved groundwater bore field (located within SML 11 Part 1) which is monitored and operates under the conditions of the approved extraction licence: GWEL-L10005.	
Assessment Aspect	YES or NO	Management Requirements	Assessment Aspect
Step 4: Is your project likely to have a significant impact on the environment?	NO	An assessment was made to evaluate the potential for a significant impact on the NT EPA's 14 environmental factors and found that Solar Site 2 is unlikely to have a significant impact on the environment. The results of the NT EPA Pre-referral screening tool are appended to this document in Attachment G .	
Step 5: Are there Aboriginal sacred sites in the Project area?	NO	See Section 2.4	
Step 6: Are there archaeological and heritage sites in the Project area?	NO	Refer to Section 5	

5 Previous Disturbance

Solar Site 2 was previously used by ELDO for a tracking station and the cleared area contained a transmission tower, building and power supply. The building was removed in 2012, however some redundant site services remain. The transmission tower was removed from the site well before the building was removed. **Figure 2** shows the area in 2011.

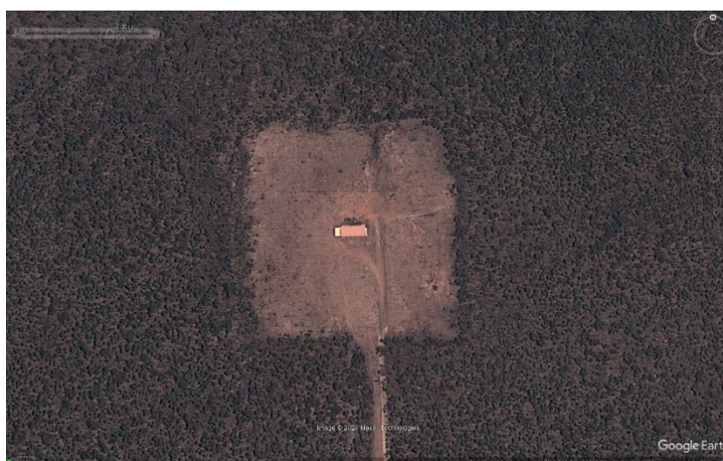


Figure 2. ELDO site in 2011

On October 2013, the Heritage Council updated the Heritage Register for the site known as the ELDO Tracking Station to be a site of the status “not declared”. The site is located on MLN 955 (SML 11 Part 1) and is identified as Eldo Tracking Station file number HAC2001/174 on the NT Heritage Register.

The site has also been previously drilled and declared to have no economic value for mining.

6 Environmental Management

6.1 RTA Gove

Works undertaken by RTA Gove for Solar Site 2 are governed by the Construction Environmental Management Plan (CEMP) developed for the project. The CEMP has been developed to provide a framework for the management of activities that have the potential to impact the environment during the clearing and fencing of Solar Site 2. The CEMP is attached in **Attachment H**.

A Level 2 Risk Assessment has also been completed to assess and mitigate the risks associated with the clearing and fencing of Solar Site 2 in preparation for the construction of the solar farm. This risk assessment is attached in **Attachment I**.

6.2 Aggreko

The management system in place for Aggreko's construction, operation and maintenance of the solar farm is detailed in **Attachment J**.

6.3 Erosion and Sediment Management

There is a low risk of erosion and sediment loss in the project area based on site-specific geotechnical investigations and the low gradient topography of the site. Based on laboratory testing, the Emerson Class of soils across the project area indicates the dispersivity of natural soils is very low and not conducive to erosion. Therefore, a site-specific certified Erosion and Sediment Control Plan (ESCP) is not required at this stage.

Clearing of the Solar Site 2 area is subject to the internal permit approval requirements of RTA Gove to meet regulatory approval and internal requirements. During the permit approvals process, the area to be disturbed is also subject to further environmental assessments, including assessment of biodiversity habitats (flora and fauna), environmental buffer zones, introduction of weed, pests and plant pathogens, potential disturbance of acid sulphate soils and erosion. This process identifies controls to be implemented for clearing and ground disturbance to mitigate the risk of erosion and sediment loss from the site.

Based on the environmental assessment for ground disturbance and clearing, the project area may be subject to further certified erosion and sediment controls.

The disturbance area is also subject to an Excavation Permit process.

7 Rehabilitation and Closure

The PPA has a term of 10 years. At the end of the term, there is the ability for the solar farms to continue to operate into the future and supply surrounding communities when mining operations have ceased in which case the assets would remain in situ and not be removed. Should key stakeholders decide that the solar farm on Solar Site 2 should cease to operate at the end of the term, the assets can be removed and the site revegetated as outlined below.

The closure objectives are to return a landscape that is safe, stable, non-polluting, and able to sustain an agreed final land use, to the Traditional Owners. These objectives set the context for the design of the final landform and the closure criteria to measure whether current environmental and social expectations have been attained.

Closure involves the rehabilitation of areas to a native vegetation community. All associated infrastructure is to be rehabilitated with the exception of key roads that the Traditional Owners have requested for access to cultural areas.

7.1 Agreed final land use

To sustain the agreed final land use, the rehabilitation of Solar Site 2 must satisfy the following closure criteria:

- Evidence that rehabilitated areas are on a trajectory towards attainment of reference sites attributes as listed in **Table 7** for at least 5 years.
- Infrastructure removed, unless otherwise agreed by Traditional Owners or relevant Government authority.

7.1.1 Vegetation closure criteria

Vegetation closure indicators are designed to provide the final assurance that rehabilitated areas have attained their specific completion criteria, as measured by the rehabilitation monitoring. Rehabilitation monitoring data

will demonstrate the vegetation established is on a trajectory towards or has attained the agreed parameters based on relevant reference sites, or the target vegetation community benchmarks. A trajectory is a consistent trend of improved condition in key vegetation and habitat parameters within a vegetation community demonstrating a pathway to a self-sustaining state.

Post closure monitoring for the vegetation indicators involves collection of vegetation and habitat data from rehabilitation and reference sites. Rehabilitation monitoring data may be used as evidence for attainment of the vegetation indicators, where possible.

The reference sites included in the monitoring program are chosen to best represent a realistic target for assessing the successful restoration of the native vegetation community. The reference sites provide a site-specific representation of vegetation community composition and structure, taking into account local environmental conditions and possible local constraints to revegetation success (such as historical site disturbance or management). The reference sites for Solar Site 2 will be chosen to represent the desired attributes for species richness, foliage projection coverage, presence of weeds, community structure, erosion and habitat features in line with the rehabilitation criteria for SML 11 Part 1. These criteria are undergoing review by Gove Operations and will be subject to ongoing revision based on outcomes from mine closure studies.

Reference sites will be monitored concurrently with rehabilitation sites to take into account temporal variation due to external factors such as rainfall and bushfire. Each round of monitoring will include direct comparisons between reference and rehabilitation sites.

The data collected from monitoring events will be analysed to determine if the rehabilitation sites have become statistically similar to the reference sites by at least 15 years after planting or re-establishment activities. This will be based on a combination univariate and multivariate statistical analyses including, where relevant, Analysis of Variance, time segment analyses and graphs for univariate data and multivariate permutational Analysis of Variance and non-metric Multidimensional Scaling for multivariate data.

Attainment of the vegetation indicators will be determined when the following targets are met:

- Attributes in rehabilitation sites listed in **Table 7** are statistically similar to or greater than reference sites at 15 years post successful re-establishment.

Table 7. Vegetation indicators for native revegetation areas

Attributes	Targets for rehabilitation relative to reference sites at Year 15
Species Richness (No. of species)	
Native over-storey	Similar to or greater than
Native mid-storey	Similar to or greater than
Native ground stratum (grasses)	Similar to or greater than
Exotic ground stratum	Similar to or less than
Total Native	Similar to or greater than
Total Exotic	Similar to or less than
Community Structure (% cover)	
Native over-storey	Similar
Native mid-storey	Similar
Native ground stratum (grasses)	Similar
Exotic	Similar to or less than

7.2 Post Closure Monitoring

Post closure monitoring programmes will demonstrate that the agreed final landform is safe, stable, and non-polluting. This evidence base will demonstrate attainment of the closure criteria within the MMP and support the Certificate of Closure application. The timeframe for completion of post closure monitoring is beyond the timeframe of this MMP.

Post closure monitoring plans are to be prepared to specifically measure the environmental performance of the final landforms by measuring the agreed closure indicators to ensure establishment of native or target vegetation community.

8 Security Estimate

Gove Operations are required to lodge a Security with DPIR under the MM Act.

The calculation of the Security Bond for Solar Site 2 can be found in **Attachment K**.

Attachment A – Solar Site 2 Area Overview

Attachment B – Solar Site 2 Layout

Attachment C – Desktop Environmental Assessment for Solar Site 2

Attachment D – NR Maps – Threatened Species

Attachment E – Significant Species Management Plan – BFTR

Attachment F – NR Maps – Weeds

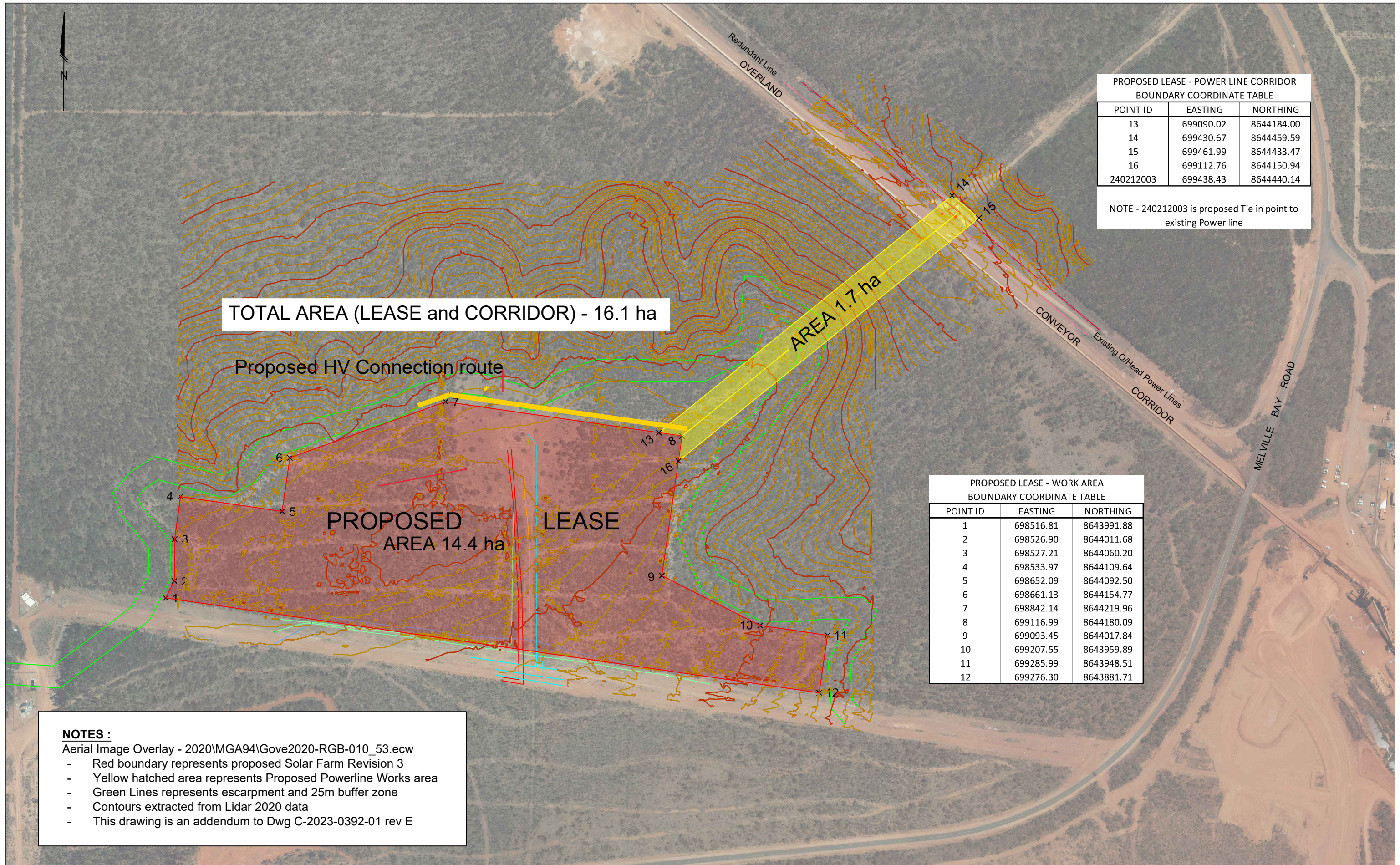
Attachment G – NT EPA Pre-referral Screening Tool

Attachment H – RTA Gove Solar Site 2 CEMP

Attachment I – Solar Site 2 Level 2 Risk Assessment

Attachment J – Aggreko Solar Site 2 CEMP

Attachment K – Security Calculation Spreadsheet



PROPOSED LEASE - POWER LINE CORRIDOR BOUNDARY COORDINATE TABLE		
POINT ID	EASTING	NORTHING
13	699090.02	8644184.00
14	699430.67	8644459.59
15	699461.99	8644433.47
16	699112.76	8644150.94
240212003	699438.43	8644440.14

NOTE - 240212003 is proposed Tie in point to existing Power line

PROPOSED LEASE - WORK AREA BOUNDARY COORDINATE TABLE		
POINT ID	EASTING	NORTHING
1	698516.81	8643991.88
2	698526.90	8644011.68
3	698527.21	8644060.20
4	698533.97	8644109.64
5	698652.09	8644092.50
6	698661.13	8644154.77
7	698842.14	8644219.96
8	699116.99	8644180.09
9	699093.45	8644017.84
10	699207.55	8643959.89
11	699285.99	8643948.51
12	699276.30	8643881.71

NOTES :
Aerial Image Overlay - 2020\MGA94\Gove2020-RGB-010_53.ecw

- Red boundary represents proposed Solar Farm Revision 3
- Yellow hatched area represents Proposed Powerline Works area
- Green Lines represents escarpment and 25m buffer zone
- Contours extracted from Lidar 2020 data
- This drawing is an addendum to Dwg C-2023-0392-01 rev E



PO Box 36990
Winnellie
NT, 0820



SURVEYOR:	KM
SURVEY DATE:	12.02.2024
DRAWN BY:	DN
CHECKED BY:	KM
JOB No:	2024-0047
APPROVED	KM

SCALE:	1:4000
COORD. SYSTEM:	MGA 94 ZONE 53
LEVEL DATUM:	AHD
CONTOUR INTERVAL:	0.5 m

TOPOGRAPHIC PLAN
2024-0047
GOVE MINE
PROPOSED SOLAR FARM LEASE TO OVERLAND CONVEYOR CORRIDOR

CLIENT: RTA GOVE - CAPITAL PROJECTS (4D BARU) | DRAWING No: T-2024-0047-02 | REV: B | SHEET No: 1 of 2

A3

AIR CONDITIONING		DRAINAGE		RAILWAY		STRUCTURE		NOTES:	
DAMPERS									
DUCTS ABOVE GROUND									
DUCTS BELOW GROUND									
EXTRACTION HOODS, FUME CUPBOARDS									
HEATER									
MISCELLANEOUS									
PIPE CHILLED WATER									
PLANT & EQUIPMENT									
VENTS									
AIRPORT									
AIRFIELD BEACON									
AIRFIELD LIGHT CABLING									
AIRFIELD LIGHT MANHOLE									
AIRFIELD REFERENCE POINT									
AIRFIELD LIGHTING									
EARTHING POINT									
GABLE MARKER									
GRASS AIRSTRIP/LANDING GROUND									
LIGHTNING MAST									
RUNWAYS HIGH STRENGTH									
SEALED RUNWAYS									
TIE DOWN POINT									
T-VASIS AND PAPI BOXES									
UNSEALED RUNWAYS, TAXIWAYS AND APRONS									
VISUAL APPROACH AIDE									
WINDSOCK									
COMPRESSED AIR									
COMPRESSOR PLANT									
MANHOLE									
MISCELLANEOUS									
OUTLET									
PIPE ABOVE GROUND									
PIPE UNDER GROUND									
PIT									
REGULATOR									
VALVE									
COMMUNICATION									
ANTENNA/ AERIAL									
CABLE AG									
CABLE UG									
CABLE MARKER									
EARTH STAKE									
FIBRE OPTIC CABLE UG									
JUNCTION BOX PIT									
MANHOLE									
PILLAR									
POLE									
PUBLIC TELEPHONE									
SATELLITE DISH									
TELEPHONE CABLE A/G									
TELEPHONE CABLE U/G									
TOWER									
FIRE CONTROL									
CABLE MARKER									
EXTINGUISHER									
FIRE WATER TANK									
HYDRANT BOOSTER									
HYDRANT MARKER									
HOSE BOX REEL									
HYDRANT ABOVE GROUND									
HYDRANT UNDER GROUND									
JUNCTION BOX PIT									
MAIN ABOVE GROUND									
MAIN UNDERGROUND									
STOP VALVE									
STOP VALVE MARKER									
FUEL									
EARTH POINT									
FILLING POINT									
PIPE ABOVE GROUND									
PIPE UNDER GROUND									
PUMP/BOWSER									
SCOUR VALVE									
STOP VALVE									
TANK									
VENT									
DOWNPIPE									
GABION / ROCK PROTECTION LAYER									
GRATED DRAIN									
INSPECTION OPENING									
KERB OUTLET									
MANHOLE									
MISCELLANEOUS									
PIPE ABOVE GROUND									
PIPE UNDER GROUND									
GRATED PIT									
STONE PITCHING									
SUB SURFACE DRAIN									
SUMP									
TRAP GULLY									
TRAP GREASE									
OPEN UNLINED DRAIN									
WATER TABLE									
ELECTRICITY									
BOLLARD LIGHT									
CABLE BOX / PILLAR									
CABLE MARKER									
EARTH STAKE									
FLOOD LIGHT									
GROUND LIGHT									
HIGH VOLTAGE CABLE ABOVE GROUND									
HIGH VOLTAGE CABLE UNDER GROUND									
LOW VOLTAGE CABLE ABOVE GROUND									
EARTH CABLE									
LIGHT POLE									
LOW VOLTAGE CABLE UNDER GROUND									
MANHOLE									
OUTLET									
POWER/FUSE BOARD									
POWER POLE									
HIGH VOLTAGE POLE									
ELECTRICITY PILLAR									
JUNCTION BOX PIT									
POLE WITH LIGHT									
LOW VOLTAGE POLE									
STAY WIRE									
SUBSTATION									
SWITCHBOARD									
TOWER									
TRANSFORMER ON GROUND									
TRANSFORMER OVERHEAD									
GAS									
CATHODE PROTECTION POINT									
GAS PIT									
INSPECTION POINT									
LPG TANK									
MARKER									
METER									
PIPE ABOVE GROUND									
PIPE UNDER GROUND									
STOP VALVE									
ROAD									
BITUMEN SURFACE									
CROWN									
EDGE OF BITUMEN									
EDGE UNSEALED ROAD									
GUARDRAIL / BARRIER									
GUIDE POST									
SHOULDER									
TRACK									
LINE MARKING									
TRAFFIC									
PARK TICKET DISPENSER									
PARKING METER									
PARKING SIGN									
STREET NAME SIGN									
TRAFFIC CABLE AG									
TRAFFIC CABLE UG									
TRAFFIC LIGHT									
TRAFFIC LIGHT CONTROL BOX									
TRAFFIC MIRROR									
TRAFFIC SENSOR									
TRAFFIC SIGN									
BALLAST									
PLATFORM									
SIGNAGE									
SIGNAL									
SIGNAL CONTROL BOX/BOARD									
TRACK									
SEWER									
ABSORPTION PIT/STRIP									
INSPECTION OPENING									
MANHOLE									
MAINTENANCE SHAFT									
TERMINAL MAINTENANCE SHAFT									
MARKER POST									
MISCELLANEOUS									
OUTFALL									
OVERFLOW RELIEF GULLY									
PIPE ABOVE GROUND									
PIPE UNDER GROUND									
PIPE INVERT RL									
POND									
PUMP STATION									
RISING MAIN ABOVE GROUND									
RISING MAIN UNDER GROUND									
SEPTIC TANK									
SEWER HOUSE CONNECTION									
SEWERAGE PIT									
TRAP GREASE									
VENT									
SURVEY									
BENCHMARK									
TEMPORARY BENCHMARK									
COORDINATED REFERENCE MARK (CRM)									
ENGINEERING PEG									
SURVEY PILLAR									
SURVEY STATION									
RESECTION STATION									
CADASTRE									
LOCKSPIT									
ORIGINAL CONC BLOCK (OCB)									
CADASTRAL PEG (OP)									
REFERENCE MARK									
REFERENCE MARK GONE									
ORIGINAL CONCRETE POST (OCP)									
CADASTRAL BOUNDARY									
EASEMENT									
PARCEL NUMBER									
TOPOGRAPHIC									
BANK BOTTOM									
CULTURAL HERITAGE REGION									
GRADE CHANGE									
NATURAL SURFACE									
QUARRY / SOIL PIT									
ROCK									
SANDHILL / DUNE									
BANK TOP									
EDGE OF WATER									
WATERCOURSE INVERT									
SWAMP									
WATER LEVEL									
VEGETATION									
CULTIVATION / ORCHARD / PLANTATION									
EDGE OF VEGETATION									
GARDEN BED / LANDSCAPING									
LAWN									
MANGROVES									
PALM TREE									
SHRUB									
STUMP									
TREE									
AWNING/COVERED WAYS									
BARBECUE									
BOLLARD									
BUILDING									
CLOTH HOIST / LINE									
EDGE OF CONCRETE									
FENCE LINE									
FENCE POST									
FINISH SURFACE LEVEL									
FLAG POLE									
FINISH FLOOR LEVEL									
GATE									
BOOM GATE									
GRID STOCK									
GUY WIRE									
LITTER BIN									
MAST / PYLON									
MONUMENT									
MONITORING WELL									
PLAYGROUND									
POST/POLE									
RAILING									
RAMP									
RETAINING WALL									
ROOF LINE / EAVES									
SEAT									
SERVICE DUCT ABOVE GROUND									
SERVICE DUCT UNDER GROUND									
HOARDING / BILLBOARD									
SILO									
SOLAR ABSORBER PANEL									
SPORT FACILITY									
SWIMMING POOL									
TIDE GAUGE									
GEO TEST PIT									
TOWER/AERIAL									
WALL									
WINDMILL									
MANHOLE									
UNKNOWN LINE ABOVE GROUND									
UNKNOWN LINE UNDER GROUND									
WATER SUPPLY									
IRRIGATION CONTROL UNIT									
IRRIGATION PIPE ABOVE GROUND									
IRRIGATION PIPE UNDER GROUND									
SPRINKLER									
VALVE									
BORE / WELL									
DRINK FOUNTAIN									
WATER MARKER									
MANHOLE									
MISCELLANEOUS									
STOP VALVE MARKER									
PIPE ABOVE GROUND									
PIT									
PIPE UNDER GROUND									
PUMP STATION									



Gove Operations

Desktop Environmental Assessment for Gove Solar Site 2

21/04/2024

Executive Summary

RTA Gove has proposed the construction of a solar farm on the mine lease in the locality of the mine offices and Gove Airport.

The project footprint is located within the Arnhem Coast (ARC) bioregion. Inland from the coast, the dominant vegetation type is eucalypt tall open forest, typically dominated by Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*Eucalyptus tetradonta*).

Nineteen species of weeds were recorded incidentally during the flora surveys and were restricted to scattered locations along roadsides and recorded only while undertaking targeted searches. One weed species (*Cryptostegia madagascariensis*) is a declared Class A species and Gove Operations is obliged to control and attempt to eradicate this species. Three other recorded weeds (*Hyptis suaveolens*, *Sida acuta* and *Stachytarpheta cayennensis*) are declared Class B weeds. Their spread is to be controlled and these species are not to be introduced in the Northern Territory.

Most of the area of the project footprint recently burnt in 2023, with the area experiencing between 2 and 10 burns in the period of 2000 to 2023. These burns occurred late in the fire season, and these fires are usually hotter than fires earlier in the dry season and have a more detrimental effect on flora and fauna. The hotter fires effect the ground and mid strata, which have evolved some fire resilience, and the more fire-sensitive canopy stratum.

Significant Flora

No threatened species that are protected were detected in the survey area. Of threatened species known from the region, only *Erythroxylum pusillum* (listed as endangered) is likely in eucalypt woodland. The only known population of this species is located 0.5 km northeast of the survey area, this places it some distance from the proposed project footprint. Targeted searches for *E. pusillum* failed to detect the species, despite the ideal timing of the surveys; the known population had not yet lost its leaves (the species is deciduous). Given its low propensity for dispersal, it is considered highly unlikely that *E. pusillum* occurs within the survey area.

Threatened Fauna Species

Six species of conservation significance were detected during the fauna surveys. One fauna species detected during the surveys, the black-footed tree-rat (*Mesembriomys gouldii*), is classified as Vulnerable. Three species, the northern brown bandicoot (*Isodon macrourus*), the Arnhem sheath-tail bat (*Taphozous kapalgensis*) and the mulga snake (*Pseudechis australis*), are listed as Near Threatened species. Two species, the Arnhem shovel-nosed snake (*Brachyuophis morrisi*) and the blue-tongued lizard (*Tiliqua scincoides*), are listed as Data Deficient. Only the Sheath-tailed Bat was found to be in the area of the project footprint. However, they are unlikely to be impacted by clearing and construction due to the abundance of suitable habitat.

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1. Introduction

RTA Gove has proposed the construction of a solar farm on the mine lease that will involve the clearing and fencing of a 14.4ha site as well as a 1.6ha corridor from the solar farm to the 22kV town feeder. This report is not a risk assessment, as it does not consider project activities or their potential impacts on ecological values.

1.1 Project Footprint

For the purpose of this report, the project footprint includes the areas of land that will be directly disturbed by project activities, as well as adjacent areas that could be indirectly impacted by the project activities – for example, surrounding habitats that could be affected by emissions of dust and/or noise, or downstream habitats that could be impacted by changes in surface water or groundwater flows.

1.2 Context

In preparation for this project, as well as for other projects on nearby land, many ecological surveys have been undertaken. These surveys have covered a broad range of areas, including vegetation communities, faunal assemblages, threatened fauna and flora species, and invasive species. This report collates data from surveys conducted between 2015 and 2019 within the project footprint and the wider region.

1.3 Scope

This report covers the terrestrial flora and fauna of the region. It compiles the relevant information from previous studies and presents supplementary information to address the following:

Provide updated results of targeted surveys for threatened species in areas where vegetation is to be cleared as part of the Proposal.

The presence or likely presence of species listed under the EPBC Act and/or the Territory Parks and Wildlife Conservation Act 1976, including but not limited to:

- *Partridge pigeon (eastern) (Geophaps smithii smithii) and black-footed tree-rat (Mesembriomys gouldii gouldii)*
- *Suitable habitat for listed threatened species.*
- *The presence, or likely occurrence, of introduced and invasive species.*
- *Listed threatened communities.*

Quantify and map values associated with sensitive or significant vegetation types and ecosystems including but not limited to:

- *Cycads*
- *Riparian vegetation*
- *Groundwater dependent ecosystems.*

1.4 Report Structure

To address the scope described above, this report is structured as follows:

Section 1	Introduction
Section 2	Desktop review of the general environmental context of the project (climate, land use, bioregions, surface water, land systems and fire history).
Section 3	Methods and results of vegetation surveys within the project footprint, including targeted surveys for significant vegetation, threatened flora and weeds.
Section 4	Methods and results of fauna surveys within the project footprint and the surrounding region, including targeted surveys to identify the presence (or likely presence) of threatened species.
Section 5	'Likelihood of occurrence' assessment using desktop information and previous survey results to determine which threatened species have a reasonable likelihood of occurring within the project footprint.
Section 6	References

2. General Environment

This section presents the over-arching environmental context within which the project will occur. A description of vegetation is presented in Section 3.2.

2.1 Weather and Climate

Gove Peninsula has a monsoonal climate, influenced by coastal factors, and is characterised by hot, wet, humid summers and mild, drier winters.

The Gove region experiences most of the annual rainfall over a distinct wet season from December to April, characterised by an active northwest monsoon. Thunderstorms are common, and heavy rainfall events can occur, often associated with tropical cyclones. On average, every two years a tropical cyclone and gale force winds are expected to pass near Gove. As well as generating very high wind forces, cyclones can also cause storm surges in addition to considerable wave action.

Tropical cyclones in Australia's northern region form predominately during the wet season between November and April. There are on average 7.7 days per season when a cyclone exists. The north-western Gulf of Carpentaria near Gove has the highest concentration of cyclone days. The Gulf of Carpentaria averages two cyclones a year.

The winter months from April to November are cooler and drier with south-easterly trade winds. The driest months are typically August to October, when evaporation usually exceeds the monthly rainfall. The mean annual evaporation exceeds the mean annual rainfall by 50%, however rainfall in this area is known to be highly variable and may exceed the evaporation rates in wetter years. Median monthly rainfall in the dry season is less than 60mm, and months with no rainfall are common. Sea breezes have a local influence on the strong trade winds during these months.

Annual rainfall totals since 1971 have varied from 654mm to 2,572mm.

2.2 Land Use

The proposed site for the project is bounded on 3 sides by pre-existing infrastructure. Melville Bay Road bounds the west of the site with an access road to the south and to the north the conveyor belt and an existing power line.

Surrounding land uses include bauxite extraction, residue disposal, airport operations and the townships of Yirrkala and Nhulunbuy. To the northeast of the proposed site are areas of bushland not included in the mine lease.

2.3 Bioregion

Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture the large-scale geophysical patterns across Australia. These patterns in the landscape are linked to fauna and flora assemblages and processes at the ecosystem scale, thus providing a useful means for simplifying and reporting on more complex patterns of biodiversity (NSW National Parks and Wildlife Service, 2003). NT bioregions are described in (Baker, et al., 2005).

The project footprint is located within the Arnhem Coast (ARC) bioregion which occupies approximately 33022km² and comprises a coastal strip extending from just east of the Cobourgh Peninsula to just north of the mouth of the Rose River in southeastern Arnhem Land and includes many offshore islands. Inland from the coast, the dominant vegetation type is eucalypt tall open forest, typically dominated by Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*E. tetradonta*), with smaller areas of monsoon rainforest and eucalypt woodlands (Baker, et al., 2005).

2.4 Surface Water

The Yirrkala Creek catchment flows to the northeast into Gunyapinya Swamp before discharging to the coastline north of Yirrkala. Shady Tree Creek is ephemeral and flows east from the mine area into the dune deposits of Rocky Bay or into Rocky Bay Creek that lies at the eastern end of Rocky Bay.

The Latram River catchment lies south and west of the mine and drains in an overall northwest direction, into the head of Melville Bay. Latram River provides important community recreation areas, aquatic ecosystem habitats and riparian areas. The conveyor corridor crosses numerous small creek beds, which mostly flow into the North River catchment.

2.5 Land Systems

Land systems are described as ‘an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation’ (Stewart, 1968). These have been mapped by across the NT by the government and are at a significantly smaller scale than a bioregion (i.e. bioregions constitute many different land systems).

The proposed project footprint only falls within the Gove land system as defined by the Land Systems of Arnhem Land report (Lynch & Wilson, 1998). The Gove land system is summarised below (Table 1).

Table 1: Land Systems of Arnhem Land

Name	Unit	%	Landform	Soil	Vegetation
Gove	1	80	Gently undulating plains; <3% slope; bauxitic surface gravel; well drained	Red Kandosols	Tall open woodland of <i>E. tetradonta</i> with <i>E. miniata</i>
	2	20	Gently undulating plains; <3% slope; up to 50% laterite outcrop; 50-90% lateritic/bauxitic surface gravel; well drained	Leptic Rudosols	Mid high to tall woodland of <i>E. tetradonta</i> and <i>E. miniata</i>

2.6 Fire

The Northern Australia Fire Information website provides information for the last year burnt and frequency of burn (Appendix A). These maps show a large portion of the area experienced a burn in 2023 (Figure 1). From 2000 to 2023 this area experienced between 2 and 10 burns (Figure 2). This is slightly higher than the average for the Gove Peninsula yet far less often than areas of Arnhem Land to the southeast. The fires occurring in this area tended to be late in the fire season.

Late burn fires are typically hotter than those occurring earlier in the Dry season. They are often anthropogenic in origin (i.e. not caused by lightning), and their effect on native flora and fauna is usually more detrimental. These hotter, more intense fires affect not just the ground and mid strata, which have evolved to adapt to fire, but also the more fire-sensitive canopy stratum.

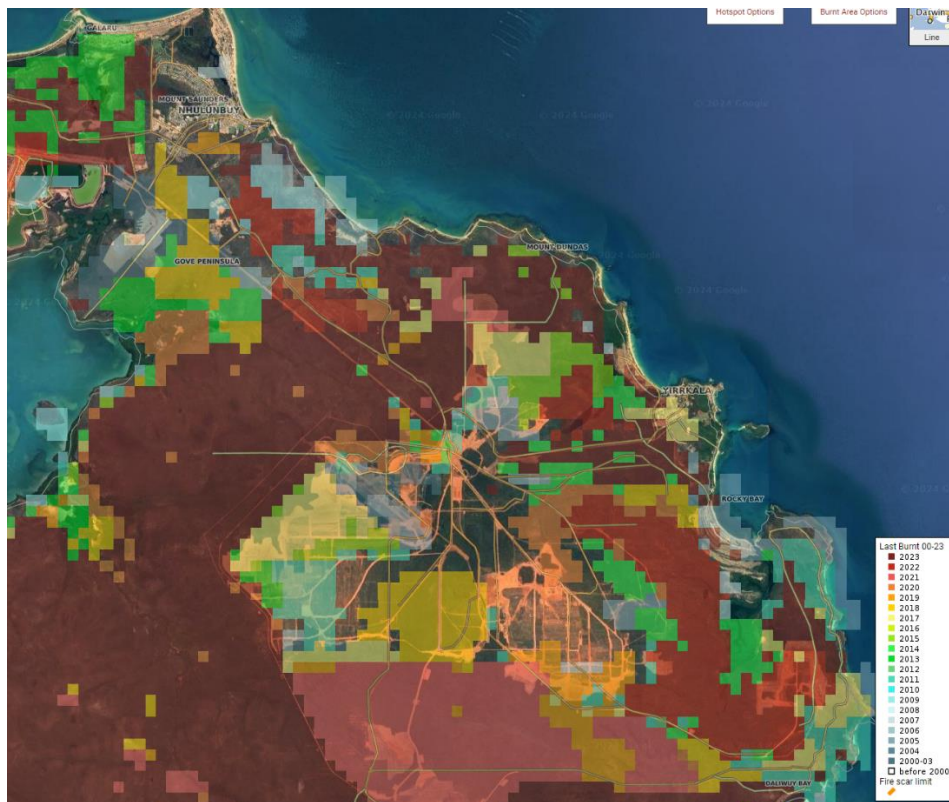


Figure 1: Year of Last Burn, Gove Peninsula

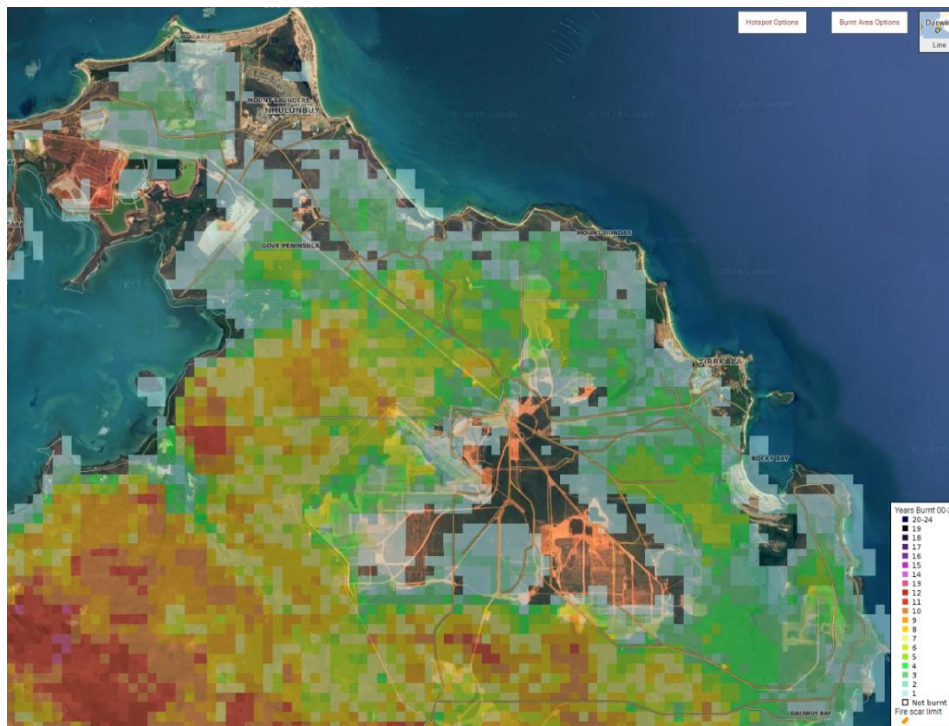


Figure 2: Fire Frequency, Gove Peninsula, 2000-2023

3.1 Vegetation

This section describes the vegetation and flora surveys that have been previously undertaken for this project, as well as for adjacent projects.

3.1 Surveys

Given the extensive surveys completed over the 15 years preceding 2015, the mine lease area is one of the best surveyed areas in eastern Arnhem Land. The most recent, and most relevant, survey was completed by MET Serve in 2015.

3.1.1 Region

In 2015, MET Serve were commissioned to produce a pre-clearing flora report. In total, 476.1ha of remnant *Eucalyptus tetrodonta*-dominated forest in three locations across the mining lease. The survey focused on three distinct areas, one northern and two southern.

3.1.2 Project Footprint

The northern survey area almost completely encapsulating the proposed project footprint. 12 transects were also completed (10x100m) with one transect very near the proposed project footprint (Figure 3). These transects were positioned to capture spatial variation in soil depth, rock outcropping and fire history. Vegetation surveys covered most of the project footprint and targeted searches included areas contained within the project footprint.

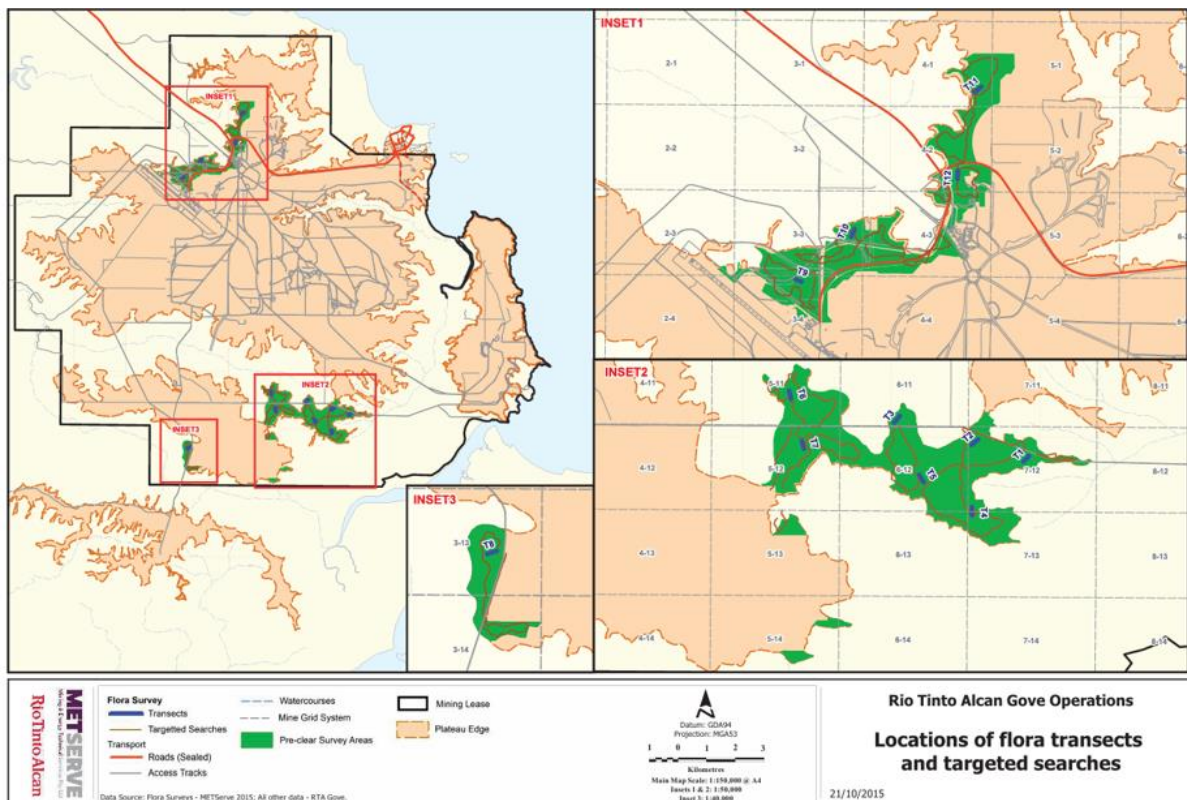


Figure 3: Locations of Floral Transects and Targeted Searches

3.2 Results

This section presents the results from the survey described above, and details the vegetation communities, weeds, significant vegetation types and threatened flora species present within the project footprint.

3.2.1 Vegetation Communities

Two major vegetation communities have been identified in the area within which the project footprint is located. 80% of the region is made of tall open woodland of *E. tetradonta* with *E. miniate* and the remaining 20% is made of mid high to tall woodland of *E. tetradonta* and *E. miniate*. The common name for these vegetation communities is open forest (CSIRO, 2018). Due to the positioning of the project footprint upon the main mine plateau, there is a lack of the of interest riparian vegetation communities.

3.2.2 Threatened Species

No threatened species protected under the *Environment Protection and Biodiversity Conservation Act 1999*, or the *Territory Parks and Wildlife Conservation Act 2006* (TPWC Act) were detected in the survey area. Of threatened species known from the region (Cowie & Stuckey, 2008), only *Erythroxylum pusillum* (listed as Endangered under the TPWC Act under the synonym *Erythroxylum* sp. Cholmondely Creek) is likely in eucalypt woodland. The only known population of this species is located 0.5 km northeast of the survey area. Targeted searches for *E. pusillum* failed to detect the species, despite the ideal timing of the surveys; the known population had not yet lost its leaves (the species is deciduous). The known population reproduces through the growth of runners. This has created a high density of individuals within a very small area (~1ha). Given its low propensity for dispersal, the lack of additional records from elsewhere in the Gove Peninsula, and the failure to detect the species during the current surveys, it is considered highly unlikely that *E. pusillum* occurs within the survey area.

3.2.2.1 Near Threatened or Data Deficient Species

Six species of flora that are listed by the Northern Territory Government as having the conservation statuses Near Threatened or Data Deficient (under the TPWC Act), were recorded in the survey area (Table 2). The locations where these species were recorded are shown in Figure 4. All six species have been recorded widely in previous surveys of the mining lease.

Table 2: Near Threatened or Data Deficient Floral Species

Species	Status*
<i>Alysicarpus brownii</i>	DD
<i>Calochilus holtzei</i>	DD
<i>Crotalaria prostrata</i>	NT
<i>Dipteracanthus bracteatus</i>	NT
<i>Hibbertia scabra</i>	NT
<i>Spermacoce juncta</i>	NT

*Under the TPWC Act: DD = Data Deficient, NT = Near Threatened

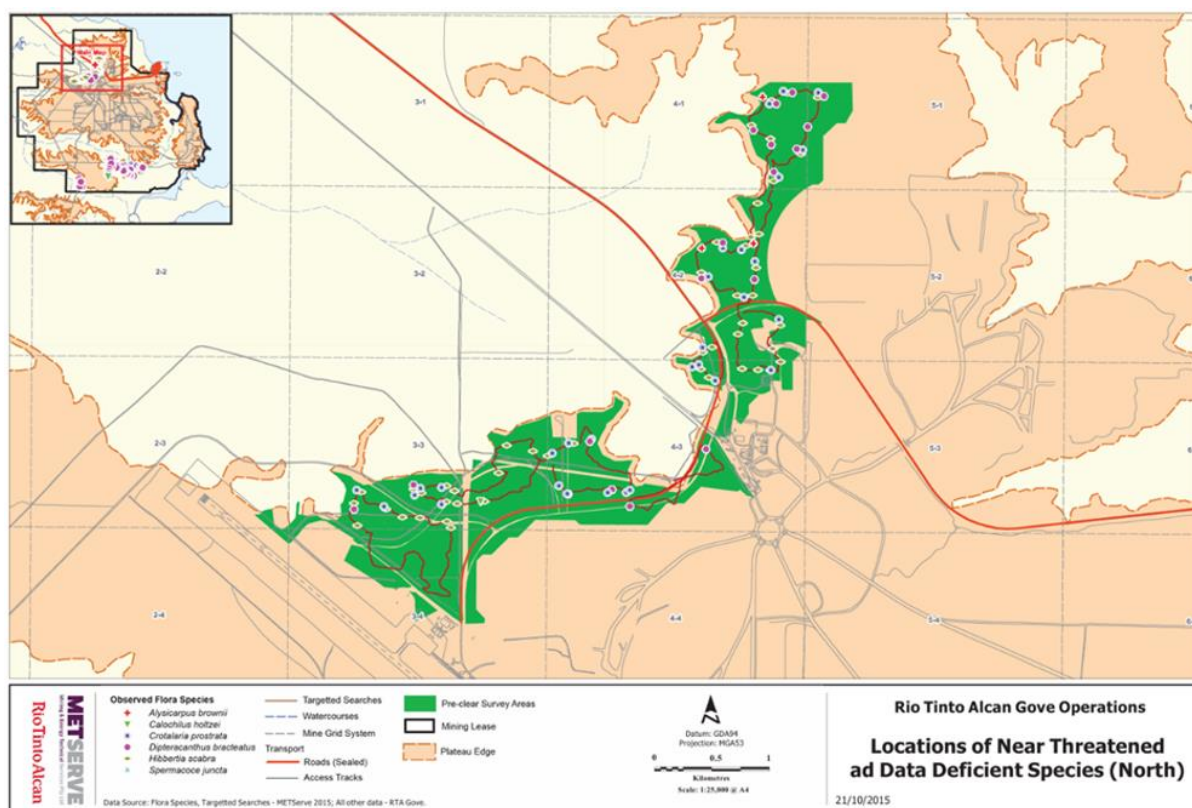


Figure 4: Locations of Near Threatened and Data Deficient Species (North)

3.2.3 Weeds

Nineteen species of weeds were recorded incidentally during the flora surveys (Table 3) and were restricted to scattered locations along roadsides and recorded only while undertaking targeted searches.

One weed species (*Cryptostegia madagascariensis*) is a declared Class A species and Gove Operations is obliged to control and attempt to eradicate this species. Three other recorded weeds (*Hyptis suaveolens*, *Sida acuta* and *Stachytarpheta cayennensis*) are declared Class B weeds. Their spread is to be controlled and these species are not to be introduced in the Northern Territory, under the Weeds Management Act. Sites where these species were recorded are shown in Figure 5.

Table 3: Weeds Identified During Floral Surveys

Scientific Name	Common Name	Transect Location	Pest Status*
<i>Aeschynomene americana</i>	Shyleaf	Incidental	Not Declared
<i>Alysicarpus vaginalis</i>	Alyce Clover	Incidental	Not Declared
<i>Calopogonium mucunoides</i>	Calopo	Incidental	Not Declared
<i>Cenchrus pedicellatus</i>	Annual Mission Grass	Incidental	Not Declared
<i>Chamaecrista rotundifolia</i>	Round-Leaf Cassia	Incidental	Not Declared
<i>Cryptostegia madagascariensis</i>	Purple Rubber Vine	Incidental	Class A and C
<i>Euphorbia hirta</i>	Asthma weed	Incidental	Not Declared
<i>Furcraea selloa</i>	Variegated False Agave	Incidental	Not Declared
<i>Gloriosa superba</i>	Glory Lily	Incidental	Not Declared
<i>Hyptis suaveolens</i>	Mint Weed, Horehound	Incidental	Class B and C

<i>Leucaena leucocephala</i>	Leucaena	Incidental	Not Declared
<i>Melinis repens</i>	Red Natal Grass	Incidental	Not Declared
<i>Merremia dissecta</i>	White Convolvulus Creeper	Incidental	Not Declared
<i>Mitracarpus hirtus</i>	White Eye	Incidental	Not Declared
<i>Passiflora foetida</i>	Stinking Passionfruit	Incidental	Not Declared
<i>Sida cordifolia</i>	Flannel Weed	Incidental	Class B and C
<i>Stachytarpheta cayennensis</i>	Dark Blue Snakeweed	Incidental	Class B and C
<i>Stylosanthes humilis</i>	Shrubby Stylo	Incidental	Not Declared
<i>Tecoma stans</i>	Yellow Bells	Incidental	Not Declared

*Weed class under the Weeds Management Act 2001.

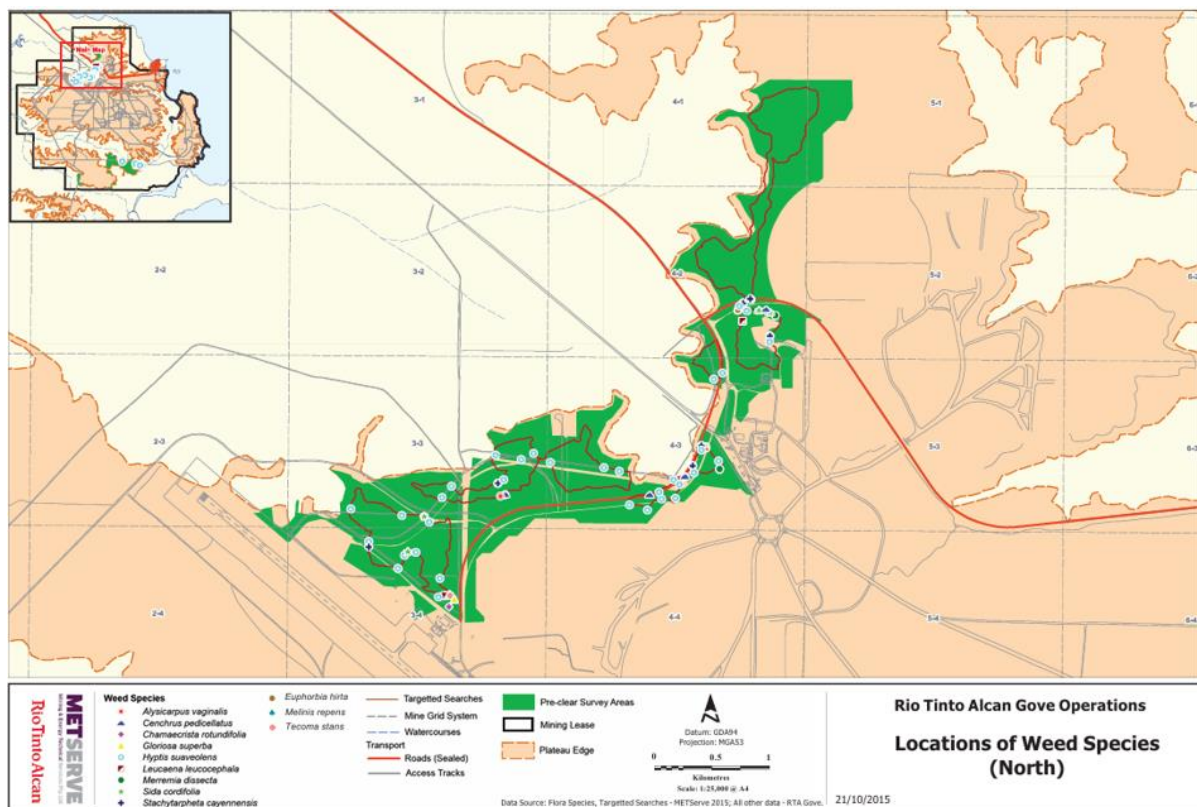


Figure 5: Location of Weed Species (North)

3.2.4 Threatened Ecological Communities

The EPBC Protected Matters Search Tool report did not identify any Threatened Ecological Communities that may occur within the project footprint (Appendix B).

3.2.5 Significant Vegetation

Significant vegetation types are those considered significant under the NT Land Clearing Guidelines. These vegetation types are unique to the NT and/or have inherently high biodiversity values. There are no vegetation types within the project footprint considered significant/sensitive.

3.2.6 Groundwater-Dependent Ecosystems

Groundwater-dependent ecosystems (GDE's) refer to 'natural ecosystems that require access to groundwater to meet all or some of their water requirements on a permanent or intermittent

basis, so as to maintain their communities of plants and animals, ecosystem processes and ecosystem services’ (Richardson, et al., 2011). Based on definitions from Eamus et al. (2006), the Atlas of Groundwater Dependent Ecosystems maps three types of GDE's – subterranean, aquatic (i.e. ecosystems dependant on surface expression of groundwater) and terrestrial (i.e. ecosystems which accesses sub-surface groundwater to meet some or all of its water requirements).

Subterranean GDE's have not been mapped for the NT, but there is no surface evidence of any cave systems within the project footprint. The Atlas identifies areas to the northeast of the project footprint to be terrestrial GDE's with no aquatic GDE's identified (Figure 6).

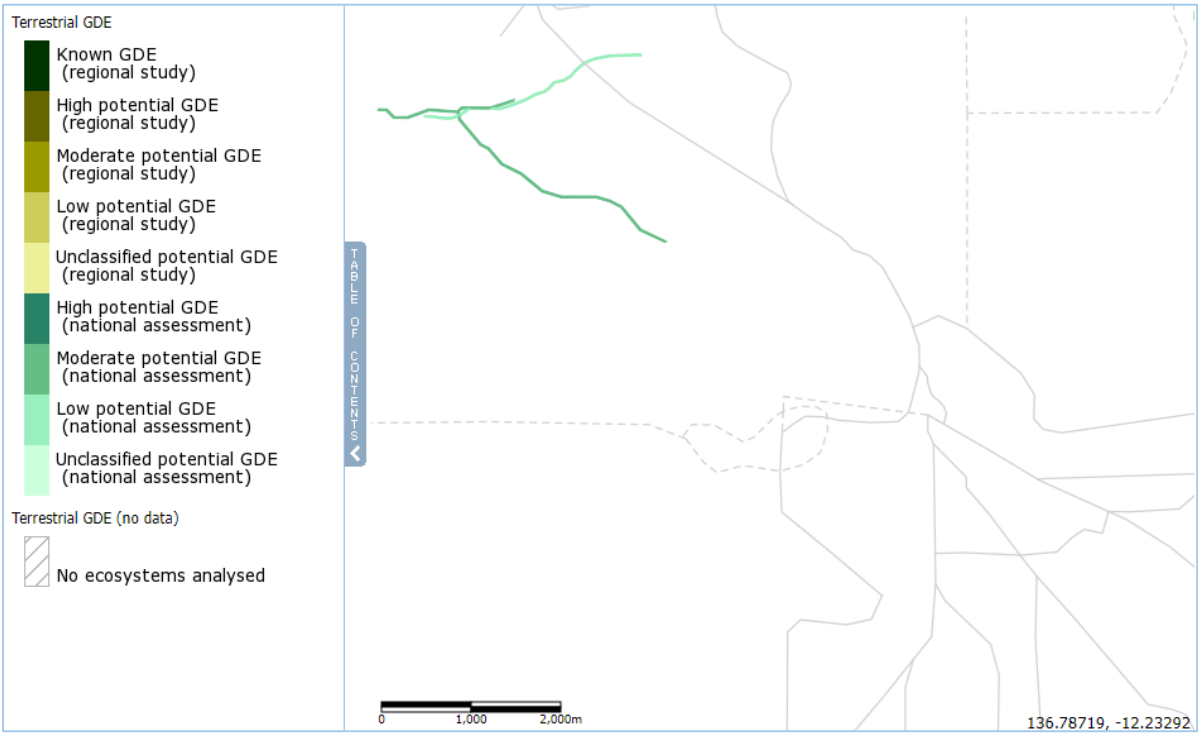


Figure 6: Terrestrial GDE's Within the Vicinity of the Project Footprint

4. Fauna

This section describes the fauna surveys that have been previously undertaken for this project, as well as for adjacent projects.

4.1 Surveys

The project footprint and surrounds have been survey previously for clearing operations relating to mine operations. This survey was conducted in 2016 by MET Serve.

4.1.1 Region

The MET Serve survey was conducted in two blocks of *Eucalyptus tetradonta* - *Eucalyptus miniata* open woodland on mining lease in 2015 and 2016. One survey block, the North-western block (NW block), was adjacent to the airport. The second block, the South-eastern block (SE block), was located along the plateau edge on the south-eastern side of the Shady Tree Creek haul road. Both blocks were surveyed for vertebrate fauna. Six replicate trap sites were installed in each of the survey blocks. All sites operated for 72 hours during the wet season and 72 hours in the dry season.

The NW block also lies on the outer-edge of the bauxite plateau (Figure 7). This site is adjacent to areas on the mine which have previously been cleared or mined to the east and north and the airport to the south-west. However, it is also connected to areas off-plateau to the north-west which will never be mined. Connection with these off-plateau areas creates a large area of connectivity with remnant woodlands across the Gove Peninsula (Figure 8). Although all habitat on the plateau will either have been, or will be, eventually cleared, all habitat off-plateau, will never be cleared. This creates long-lasting corridors supporting refugia for fauna.

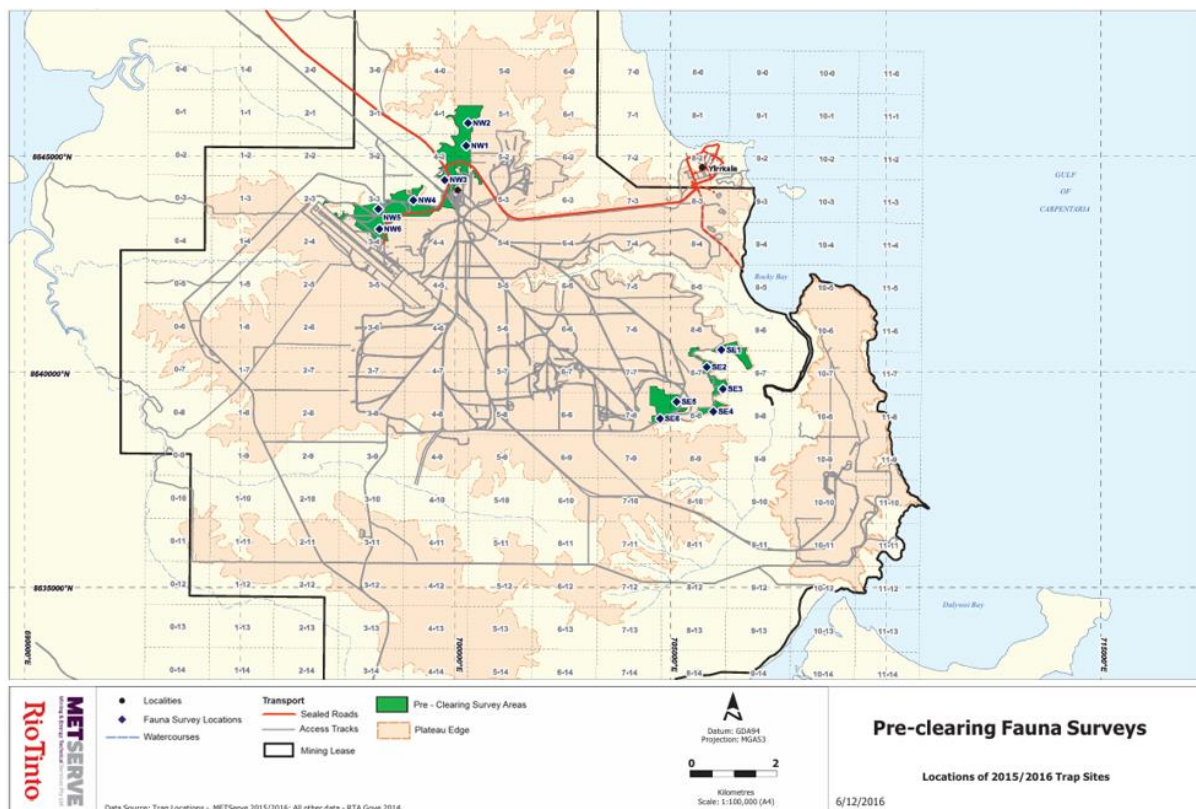


Figure 7: Pre-clearing Fauna Surveys Location of 2015/2016 Trap Sites

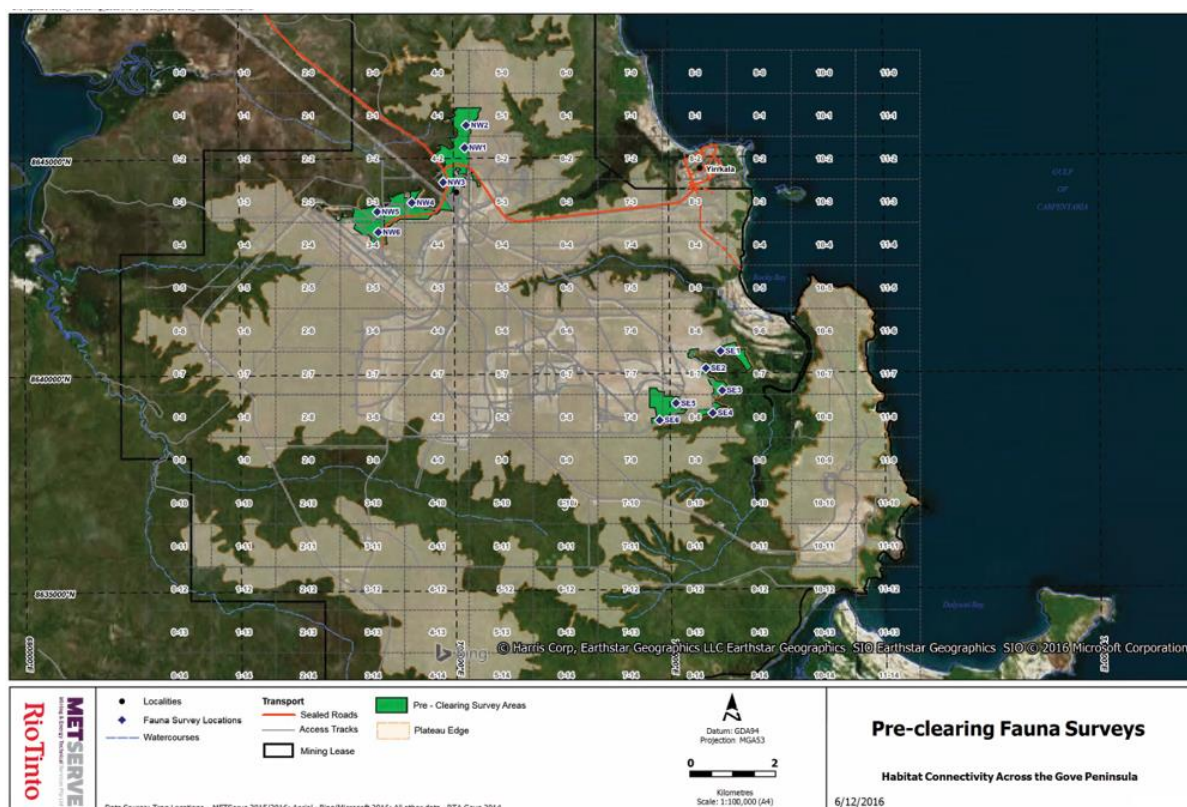


Figure 8: Pre-clearing Fauna Surveys Habitat Connectivity Across the Gove Peninsula

4.1.2 Project Footprint

Of the surveyed areas, the NW block fully covers the intended project footprint (not including power transmission corridor). The trap site NW4 was also located within the project footprint.

4.1.3 Trap Site Locations

Each trap site was installed according to the methodology used in previous vertebrate surveys on the mining lease (Woinarski, Armstrong, & Hokkanen, Pre-clearing fauna survey report for, 2007) (Woinarski, Hill, Brennan, Proos, & Milne, 2008) (Woinarski, Hokkanen, Milne, & Armstrong, 2008) (MET Serve, 2013), which follows elements of the standard fauna survey trapping guidelines for the Northern Territory (*Environmental Assessment Guidelines for the Northern Territory: Terrestrial Fauna Survey July 2011*).

Each survey site consisted of a 50 x 50 m square with a single cage trap placed at each corner. Elliott traps were positioned equidistantly around the perimeter, with five Elliott traps between each cage trap. A 10m long drift fence was installed in the centre of the trap array, and eight funnel traps were positioned in pairs along this fence. Pitfall buckets were not installed in either block as an excavation permit could not be obtained.

All traps were opened each afternoon, between 16:00 and 18:00. Traps were emptied between 06:00 and 09:00 the following morning. Elliott and cage traps were closed during the day to prevent heat stress to trapped animals. Funnel traps remained open during the day and were re-checked immediately prior to opening all traps the following afternoon. Each trap site remained in operation for three consecutive days.

4.2 Results

This section highlights general trends and presents records of threatened and pest species.

4.2.1 General Biodiversity

A total of 95 fauna species were detected during the surveys, and an additional 4 species of microbats were considered possible, based on inconclusive call recordings. Several species of microchiropteran bat have identical or similar calls as detected by the Anabat Express. Therefore, definitive identification of species was not possible for some calls. In total, 5 species of amphibian, 23 species of reptile, 50 species of bird, and 17 mammal species were recorded during the project (Table 4).

Two introduced species, the cane toad (*Rhinella marina*) and domestic cattle (*Bos taurus*) were recorded within the survey areas. Cane toads were commonly encountered throughout the southeastern block. Cattle were detected at a single site within the south-eastern block (SE1).

Table 4: Species of Fauna Identified During Surveys

Taxon	Dry Season 2015		Wet Season 2016	
	No. Individuals	No. Species	No. Individuals	No. Species
Mammals*†	85	7	24	5
Birds	1185	32	1084	44
Reptiles	131	16	273	19
Amphibians	2	2	12	4
Total	1402	57	1393	72
Microchiropteran Bats	N/A	6 (+2) ‡	N/A	8 (+3) ‡

*Excludes microchiropteran bats detected via AnaBat recordings

†Includes non-native species

‡Numbers of potential but unconfirmed species' in parentheses

4.2.2 Threatened Species

Six species of conservation significance were detected during the 2015/2016 fauna surveys (Table 5). One fauna species detected during the surveys, the black-footed tree-rat (*Mesembriomys gouldii*), is classified as Vulnerable under the Territory Parks and Wildlife Conservation Act and Endangered under the EPBC Act. Three species, the northern brown bandicoot (*Isodon macrourus*), the Arnhem sheath-tail bat (*Taphozous kapalgensis*) and the mulga snake (*Pseudechis australis*), are listed as Near Threatened species under the TPWC Act. Two species, the Arnhem shovel-nosed snake (*Brachyuropsis morrisi*) and the blue-tongued lizard (*Tiliqua scincoides*), are listed as Data Deficient under the TPWC Act.

Table 5: Threatened Species Identified by Fauna Surveys

Locations of Species of Conservation Significance						
Species	Latitude	Longitude	Site	No. Individuals	NT Classification	EPBC
Black-footed Tree-rat	-12.305818	136.887153	Incidental in SE block	1	V	E
	-12.302042	136.886307	SE5	2		
Northern Brown Bandicoot	-12.302042	136.886307	SE5	1	NT	N/A

Arnhem Shovel-nosed Snake	-12.255887	136.836447	NW3	1	DD	N/A
Mulga Snake	-12.304055	136.894182	SE4	1	NT	N/A
Common Blue-tongued Lizard	-12.262062	136.822355	NW5	1	DD	N/A
Arnhem Sheath-tail Bat	-12.299310 -12.304055 -12.302042 -12.243955 -12.255887 -12.260158 -12.262062 -12.266307	136.896158 136.894182 136.886307 136.841383 136.836447 136.829797 136.822355 136.822577	SE3 SE4 SE5 NW2 NW3 NW4 NW5 NW6	N/A	NT	N/A

4.2.3 Pest Animals

Two introduced fauna species were detected during the pre-clearing surveys. Both species are considered pest species and one, the cane toad, is listed under the EPBC Act as a key threatening process affecting native wildlife.

4.2.3.1 Feral Cattle

Feral cattle (*Bos taurus*) are known to contribute to environmental degradation of native species' habitat within Australia (Fisher, Hunt, Kutt, & Mazzer, 2007). Their impacts include soil compaction, erosion, and food plant (vegetation) reduction and decimation (Global Invasive Species Database, 2007). Several species of wildlife in the Northern Territory have been severely impacted by environmental changes caused by feral cattle. Bird species relying on wetland or low-lying vegetation for breeding purposes, can be negatively impacted by the arrival of feral cattle in an area (van Doorn, Woinarski, & Werner, 2015).

Small- and medium-sized mammals are also affected by feral cattle, through competition for food plants, spreading of weeds (potentially altering fire regimes) and removal of vegetation, which can lead to loss of shelter or invertebrate prey species from an area (Fisher, Hunt, Kutt, & Mazzer, 2007). Feral cattle have also been indicated in at least one fossorial reptile species' decline (Department of Environment, 2016).

Several species within the mining lease are potentially at risk of being affected by feral cattle. Fossorial reptiles live within the leaf litter and topsoil of the mining lease and medium-sized mammals, such as the black-footed tree-rat and the northern brown bandicoot, rely on vegetation for both food and shelter. There is also some evidence to suggest that feral predators such as cats and wild dogs visit highly disturbed areas more frequently than undisturbed areas. This may contribute to increased predation of black-footed tree-rats and other small- and medium-sized native animals on the mine site.

Feral cattle were detected in the SE block during the survey. Several were encountered daily during travel to and from sites in the SE block. Given the project footprint falls within the NW block, clearing and construction is unlikely to increase opportunities for breeding of the feral cattle and no increase in numbers is expected.

4.2.3.2 Cane Toad

The cane toad (*Rhinella marina*) has become prevalent on the Gove Peninsula and at Gove Operations since 2002 (Phillips, Brown, & Shine, 2003). This species has become a widespread pest, causing population declines in several native Australian predators (Price-Rees, Brown, &

Shine, 2010) and is listed under the EPBC Act as a key threatening process affecting native Australian wildlife. Monitors, the northern quoll, and some species of snake have suffered substantial population declines attributed to cane toads. Toads were encountered during both seasons. A single toad was detected at one fauna site during the dry season. During the wet season toads were detected at three survey sites. The clearing and construction proposed within the project footprint is unlikely to increase the local population of cane toads, as no additional pooling of water (potential breeding sites) is expected.

5. Threatened Species

The information identified certain threatened species that required investigation and assessment. In addition, to determine which other threatened species have the potential to occur in the project footprint, an analysis of bioregional flora and fauna records was undertaken. The purpose of this section is to provide an assessment of the likelihood of occurrence within the project footprint of Northern Territory and/or nationally listed threatened species.

5.1 Categories

The International Union for the Conservation of Nature (IUCN) nominates a set of criteria used to identify species at risk of extinction. These criteria are used to define categories of risk (Figure 9) which are used by the Northern Territory Government to determine which threatened species are listed under the TPWC Act, and by the Commonwealth Government to determine which threatened species are listed under the EPBC Act. This report focusses on species that are listed as Vulnerable, Endangered or Critically Endangered under the TPWC Act, the EPBC Act or both.

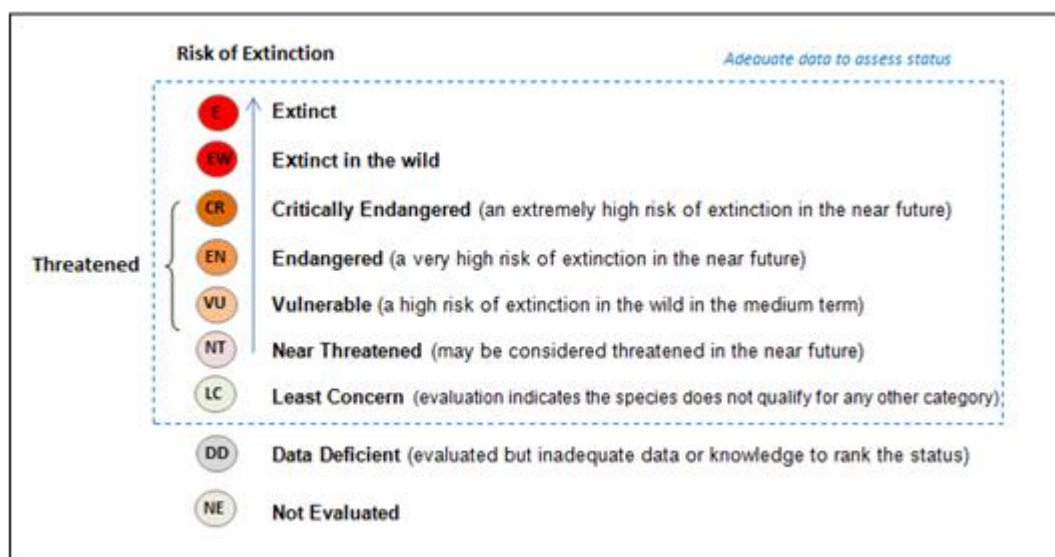


Figure 9: The IUCN red list categories of risk for species

5.2 Likelihood of Occurrence

A 'likelihood of occurrence' assessment for threatened species was undertaken based on all the information available regarding the current state of the environment within the project footprint. The assessment considered the habitats present, historic regional records of threatened species, new threatening processes, any changes in the conservation status of species, and changes in surrounding habitat availability and quality. A list of 23 threatened species that have the potential to occur in the terrestrial ecosystems was provided in an EPBC Act Protected Matters Report (Appendix B). For each of these species, the likelihood of it occurring within the project footprint was then assessed based on information relating to habitat requirements, distribution, and the number and dates of proximate records (Table 6). Likelihood ratings were defined as follows:

- a) **HIGH** – it is expected that this species lives within the project footprint because there is core habitat and recent proximate records.
- b) **MEDIUM** – this species may live within the project footprint because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records with the search area, substantial loss of habitat within the project footprint since previous records, species is naturally-rare or occurs at a low density etc.).
- c) **LOW** – this species may occur, as a vagrant, within the project footprint; however, there is only marginally-suitable habitat.
- d) **NONE** – there is strong evidence (no suitable habitat and/or the species is considered likely to be regionally-extinct) that this species will not occur within the project footprint.

Table 6: Threatened Species Likelihood of Occurrence Assessment

Likelihood	Scientific Name	Common Name	Class	Status	
				NT	Cth
HIGH	Taphozous kapalgensis	Arnhem Sheath-tail Bat	Mammal	NT	N/A
MEDIUM	Isodon macrourus	Northern Brown Bandicoot	Mammal	NT	N/A
	Mesembriomys gouldii	Black-footed Tree-rat	Mammal	VU	EN
	Pseudechis australis	Mulga Snake	Reptile	NT	N/A
	Tiliqua scincoides	Common Blue-tongued Lizard	Reptile	DD	N/A
	Brachyurophis morrisi	Arnhem Shovel-nosed Snake	Reptile	DD	N/A
LOW	Erythroxylum sp. Cholmondely Creek	N/A	Plant	VU	N/A

5.2.1 Black-footed Tree-rat

The black-footed tree-rat (*Mesembriomys gouldii*) is the largest Australian rodent and one of two species of tree-rat. The species is listed as Vulnerable under the TPWC Act and Endangered under the EPBC Act. It has recently been upgraded from Near Threatened to Vulnerable with a decreasing population trend on the IUCN red list.

Trapping operations in the NW Block show no black-footed tree-rats in the area. Many having previously moved to rehabilitated areas of the mine site.

5.2.2 Northern Brown Bandicoot

The northern brown bandicoot (*Isodon macrourus*) is a medium-sized, ground-dwelling, nocturnal mammal that eats a combination of plant matter and insects (Radford, 2012). A range of habitats are utilised, including grassland, woodland and open woodland (Gordon, 2008). Areas of sparse groundcover appear to be favoured in the Top End in the dry season (Friend & Taylor, 1985), whereas in the south of their range, dense groundcover is favoured throughout the

year (Gordon, 2008). The northern brown bandicoot is an adaptable species that readily inhabits suburban habitats and those heavily altered by weed invasion (Fitzgibbon, Wilson, & Goldizen, 2011). Individuals occupy a home range of approximately 6ha (Gordon, 2008), and habitat fragmentation has been implicated in the declines of some populations (Rankmore & Price, 2004).

Trapping operations in the NW Block show no northern brown bandicoots in the area. Populations of the northern brown bandicoot within the mine lease area have been noted to be patchy after a large-scale camera study. Recent fire activity may be responsible for this wide dispersion.

5.2.3 Arnhem Sheath-tailed Bat

The Arnhem sheath-tail bat (*Taphozous kapalgensis*) is found in the Top End of the Northern Territory, with most records restricted to the Darwin, western Arnhem Land and the Victoria River regions (McKean & Friend, 2015). The species has been recorded once in the Gove region; bat calls collected during surveys on the mining lease in 2008 positively identified this species (Woinarski, Hokkanen, Milne, & Armstrong, 2008).

Clearing of the project footprint is unlikely to significantly impact Arnhem sheath-tail bats because the species can utilise a variety of habitats in proximity to the survey area for foraging.

5.2.4 Common Blue-tongue Lizard

The common blue-tongue lizard (*Tiliqua scincoides*) is a large, terrestrial skink, widely distributed across northern, eastern, and south-eastern Australia (Cogger, 2014). The Common blue tongue lizard utilises a wide range of habitats throughout its distribution, with it being commonly detected within the Eucalypt woodlands at Gove. The species is diurnal and omnivorous feeding on both plant material and meat (insects and animal carcasses).

The clearing of the project footprint is not expected to have any significant impact on this species.

5.2.5 Arnhem Shovel-nosed Snake

The Arnhem shovel-nosed snake (*Brachyuophis morrisi*) is a small, fossorial snake with a limited distribution across the north-eastern coastal region of the Northern Territory (Cogger, 2014). It is known from the tropical Eucalypt woodlands which occur across the mining lease. The species is cryptic and rarely detected, potentially contributing to a lack of data leading to the species' being classified as Data Deficient under the TPWC Act. Although the diet of this species' is unknown, other members of the genus are known to feed only on reptile eggs (Wilson & Swan, 2010).

The most likely potential impact on this species is habitat disturbance. Any major alteration to their food source is unlikely, as most species of small reptiles in the region (skinks, geckoes, and dragons) are generally considered to be stable populations. This considered, the clearing of the project footprint is unlikely to have a significant, long-lasting impact on this species.

5.2.6 Mulga Snake

The Mulga snake (*Pseudechis australis*) is a large, venomous snake with a wide distribution across Australia, excluding only temperate NSW and the very southern parts of the continent. The species utilises a variety of habitats and feeds on other snakes, frogs, reptiles and small

mammals. The Mulga snake is diurnal although it is known to forage during the early evening and into the night during periods of high temperatures (Cogger, 2014), particularly in the northern half of its range.

As the Mulga snake is large and predatory, it has few natural enemies. Habitat alteration may contribute to the concern over this species' status although the most likely potential impact is from the consumption of toxic cane toads. Although this impact is potentially significant, the current proposed clearing of the area around trapping site NW4 should not increase the amount of potential breeding opportunities for the cane toad and staff should actively limit the potential for pooling water where possible. Considering this, the species will not be significantly impacted by the proposed clearing.

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7. Appendices

Appendix A: Fire History Report



Custom area

Fire History Report

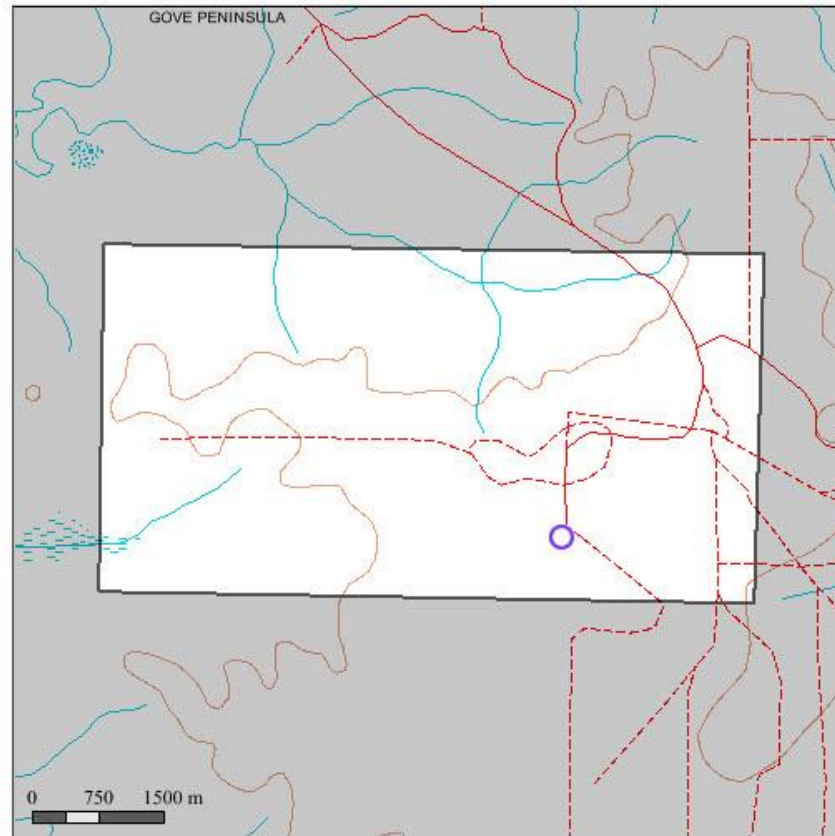


Custom area

Custom area encompasses an area of 28.05 sq km extending from 12 deg 14.0 min to 12 deg 16.0 min S and 136 deg 46.0 min to 136 deg 50.0 min E.
Custom area is located in the Arnhem Coast, bioregion(s)

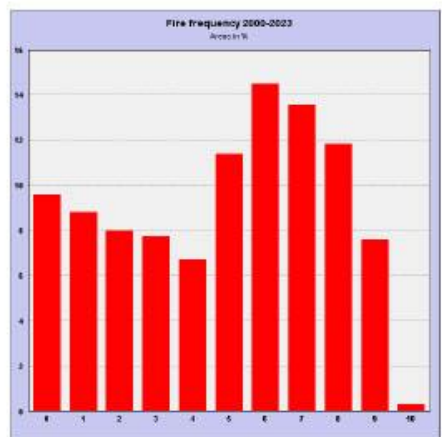


Location of Custom area



Custom area Fire History

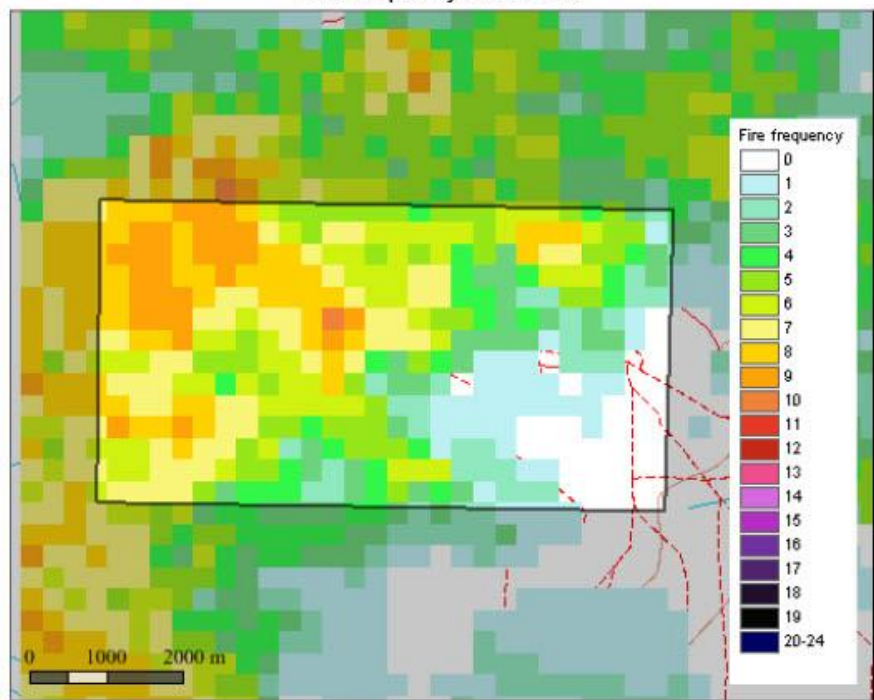
Fire frequency 2000-2023



area burnt for each fire frequency
category 2000-2023

Category	Area sq km	Area%
0	2.69	9.60
1	2.47	8.82
2	2.24	7.99
3	2.17	7.74
4	1.88	6.71
5	3.19	11.37
6	4.07	14.50
7	3.80	13.56
8	3.32	11.85
9	2.13	7.59
10	.08	.28

Fire frequency 2000-2023



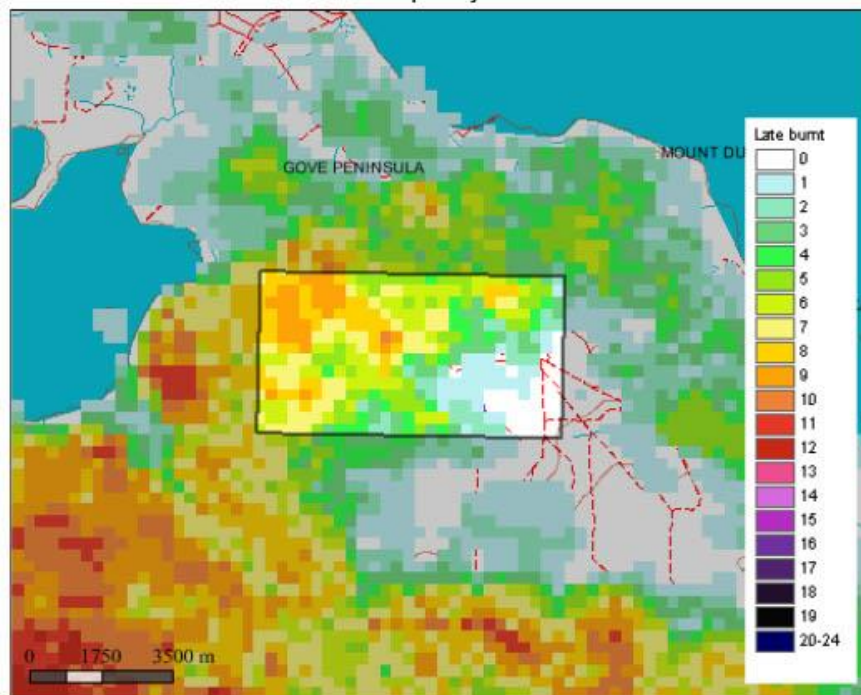
The fire frequency(250m) Layer is derived from satellite imagery sourced from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the NASA Terra satellite
Spatial Resolution: 250m x 250m pixels (at Nadir).

Late fire frequency(after July 31)
2000-2023

area burnt in each late fire frequency
category 2000-2023

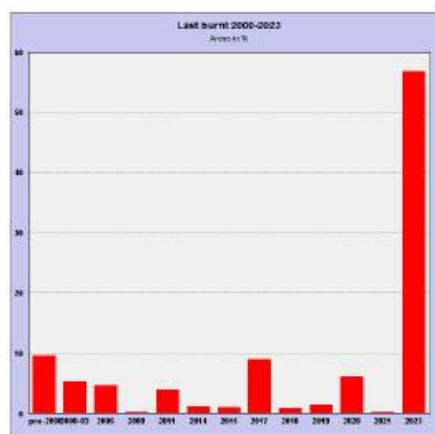
Selected area is too small to produce reliable statistics

Late fire frequency 2000-2023



The fire frequency(250m) Layer is derived from satellite imagery sourced from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the NASA Terra satellite
Spatial Resolution: 250m x 250m pixels (at Nadir).

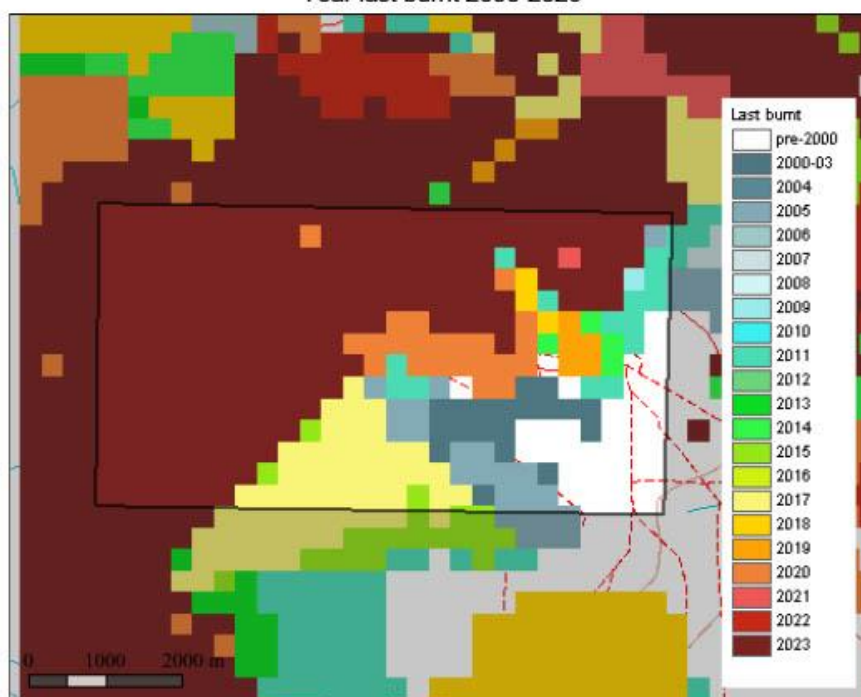
Year last burnt 2000-2023



and area of each year category

Category	Area sq km	Area%
pre-2000	2.69	9.60
2000-03	1.47	5.23
2005	1.32	4.71
2009	.08	.28
2011	1.09	3.88
2014	.30	1.07
2015	.27	.95
2017	2.52	9.00
2018	.23	.83
2019	.39	1.38
2020	1.70	6.06
2021	.08	.28
2023	15.92	56.75

Year last burnt 2000-2023



The fire frequency(250m) Layer is derived from satellite imagery sourced from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the NASA Terra satellite
Spatial Resolution: 250m x 250m pixels (at Nadir).

Fire graphs and tables refer to entire selected area including sea if present. Calculations are derived from map images or vector data, and should be taken as a guide only. Accuracy cannot be guaranteed. For small areas, figures should be rounded to the nearest whole number.

All fire map layers used in these reports have their pixels aligned to the same grid.

Fire history reports from 2000 to current and from 2000-2009 available for the unshaded area shown below. Generating these reports in the shaded area will produce a report with no data.



Last 10 year fire history reports available for the unshaded area shown below.



Appendix B: EPBC Act Protected Matters Report



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Apr-2024

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	24
Listed Migratory Species:	17

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	44
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	1
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.		
Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
MAMMAL		
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat likely to occur within area
Notomys aquilo Northern Hopping-mouse, Woorrentinta [123]	Endangered	Species or species habitat may occur within area
Petrogale concinna canescens Nabarlek (Top End) [87606]	Endangered	Species or species habitat may occur within area
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudiclunatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheath-tail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Trichosurus vulpecula amhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat likely to occur within area
PLANT		

Scientific Name	Threatened Category	Presence Text
Erythroxylum sp. Cholmondely Creek (J.R.Clarkson 9367) (Northern Territory Population) [91740]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area
Tiliqua scincoides intermedia Northern Blue-tongued Skink [89838]	Critically Endangered	Species or species habitat likely to occur within area
Varanus mertensi Mertens' Water Monitor, Mertens's Water Monitor [1568]	Endangered	Species or species habitat likely to occur within area
SHARK		
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glaucopis maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species	[Resource Information]	
Scientific Name	Threatened Category	Presence Text
Bird		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area
Fish		
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribbioned Pipehorse, Ribbioned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptile		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

EPBC Act Referrals		[Resource Information]	
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Trans-territory Gas Pipeline	2003/1186	Controlled Action	Completed

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- [Natural history museums of Australia](#)
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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NR MAPS

NR Maps - Threatened Species



Legend

Threatened Flora



Threatened Fauna

DEPWS

ALA



Metres 100 200

nrmaps.nt.gov.au

Geospatial Services Branch



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Parks and Water Security
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Significant Species Management Plan

The Black-footed Tree-rat (*Mesembriomys gouldii*)



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1 INTRODUCTION

1.1 PROJECT OVERVIEW AND BACKGROUND

Rio Tinto (RT) Gove Operations has developed a Biodiversity Action Plan (BAP) to direct, monitor and review the effective management of key biodiversity features at Gove operations in Arnhem Land in the Northern Territory. The plan has been developed in accordance with the Rio Tinto Guidance Note 'Step by Step approach to Biodiversity Planning', prepared by Rio Tinto and Fauna and Flora International (FFI). The Black-footed Tree-rat has been identified in the Gove BAP as a significant biodiversity feature that requires active management. Due to the significance of this species, a Significant Species Management Plan has been developed to provide clear directions for the identification, avoidance and mitigation of potential impacts to this threatened species.

Threatened species are defined as those species listed as Extinct in the Wild, Critically Endangered, Endangered or Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* or the *Territory Parks and Wildlife Conservation Act*. By monitoring threatened species under the guidance of a plan, changes to their population status and management can be measured and assessed with a view to adapting the plan to changing circumstances, thus improving the effectiveness of conservation management. While not a legal requirement in the Northern Territory, SSMPs are standard elsewhere in Australia, and are a valuable tool for minimising environmental impacts of mining activities and other large-scale projects.

Bauxite extraction has been ongoing on the Rio Tinto Gove Operations mining lease since the early 1970s. As part of the legislative requirements of mining this region, terrestrial fauna and flora surveys are required to be undertaken prior to vegetation clearing. Such surveys have identified a few Northern Territory threatened species potentially impacted by the mining operations. One of these is the Black-footed Tree-rat (*Mesembriomys gouldii*).

The Black-footed Tree-rat is listed as Vulnerable under the *Territory Parks and Wildlife Conservation Act* and the subspecies, *M. gouldii gouldii*, is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. The species has been recently recorded in a number of forest sites within the Gove mining lease that are earmarked for future mining (Woinarski *et al.* 2008; MET Serve 2012; 2013). Legal obligations, in addition to community interest and expectation, are powerful incentives for Rio Tinto to ensure that mining operations do not have significant long-term impacts on the future viability of local populations of the Black-footed Tree-rat. Rio Tinto recognises the regional significance of the presence of this species on the mining lease, and has initiated this SSMP as a priority management action.

1.2 PURPOSE OF THIS PLAN

The purpose of this SSMP is to identify potential impacts of mine development and operation on the Black-footed Tree-rat, and provide management measures to be implemented prior to, during and after mining to avoid and/or mitigate impacts to the species within the Gove mining lease.

This SSMP will act as a tool to assist Rio Tinto Gove Operations personnel and contractors in determining the extent of compliance required by them with regards to the regulations and guidelines applicable to the conservation of this species.

1.2.1 Specific Objectives

Specific objectives of this plan include:

- to summarise current knowledge about the species' biology and global threats;
- to identify and evaluate the potential impacts to the species during each mining phase (pre-operational to post-operational) at the Gove mine;
- to establish management strategies tailored to the Gove mining operations to mitigate potential impacts on the Black-footed Tree-rat;

- to establish appropriate review mechanisms regarding the strategies employed to minimise impacts on the species;
- to assign specific duties to responsible parties within Rio Tinto Gove Operations;
- to provide clear steps to be taken by responsible parties in the case of an emergency or accidental impact on the species; and
- to detail the procedure for ongoing monitoring of local populations of the species, for tracking population trends and assessing success of management actions.

2 LEGISLATIVE AND REGULATORY FRAMEWORK

2.1 RELEVANT LEGISLATION

While there are no legislative requirements for a SSMP in the Northern Territory, there are requirements to minimise environmental harm and impacts to threatened species. A SSMP will assist in delivering these commitments. The following legislation is relevant to this SSMP:

- 1) *Territory Parks and Wildlife Conservation Act*
All native fauna within the Northern Territory is protected under the *Territory Parks and Wildlife Conservation Act* (TPWC Act). The Black-footed Tree-rat has recently been listed as Vulnerable under Schedule 1 of the Classification of Wildlife of the NT. This threatened status increases government expectations on minimising impacts to the species.
- 2) *Mining Management Act*
Under the Northern Territory's *Mining Management Act 2013* (MM Act), a mining company has legal obligations to minimise environmental harm. This includes minimising clearing of native vegetation known to be inhabited by threatened species. Serious environmental harm, defined as irreversible or large-scale impacts, especially to matters of high conservation value, is an offense under Section 26 of the MM Act.
- 3) *Environment Protection and Biodiversity Conservation Act 1999*
Species or subspecies of wildlife that are threatened nationally are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The subspecies of Black-footed Tree-rat that occurs in the Northern Territory, *M. g. gouldii*, is listed as Endangered under this act. Any activities that will, or have the potential to, reduce the populations of nationally threatened wildlife must be approved by the Commonwealth Government.

2.2 RELEVANT GUIDELINES

The Northern Territory Government has published *Guidelines for Assessment of Impacts on Terrestrial Biodiversity* (NTEPA 2013), specifying standards for conducting fauna surveys.

The International Union for Conservation of Nature's (IUCN) Red List classifies the Black-footed Tree-rat as Vulnerable (Woinarski and Burbidge 2016). Although no additional requirements stem from this guideline, the IUCN is globally recognised as a leader in conservation and ecological community modelling, with several Australian states basing their threatened species classification system on the Red List.

The Black-footed Tree-rat is included in the *Action Plan for Australian Rodents* (Environment Australia 1995), which identifies critical areas of research required to determine the stability of populations of the species throughout Australia.

2.3 ENVIRONMENTAL MANAGEMENT FRAMEWORK AT GOVE OPERATIONS

Rio Tinto Gove Operations conducts its operations within a culture of continuous improvement, consistent with the ISO 14001 environmental management framework. ISO 14001 is an internationally recognised continuous improvement model, the key elements of which include assessing environmental risk and legal requirements, developing objectives and targets for

improvement, training, operational control, communication, emergency response, corrective actions, audits and reviews (**Figure 2-1**).

This SSMP has been developed and will operate in accordance with the environmental management system in place at Rio Tinto Gove Operations. It will be managed largely under operation control (**Figure 2-1**), and fits into the framework at the level of planning, management and implementation. It aims to provide input specific to the management of the Black-footed Tree-rat.

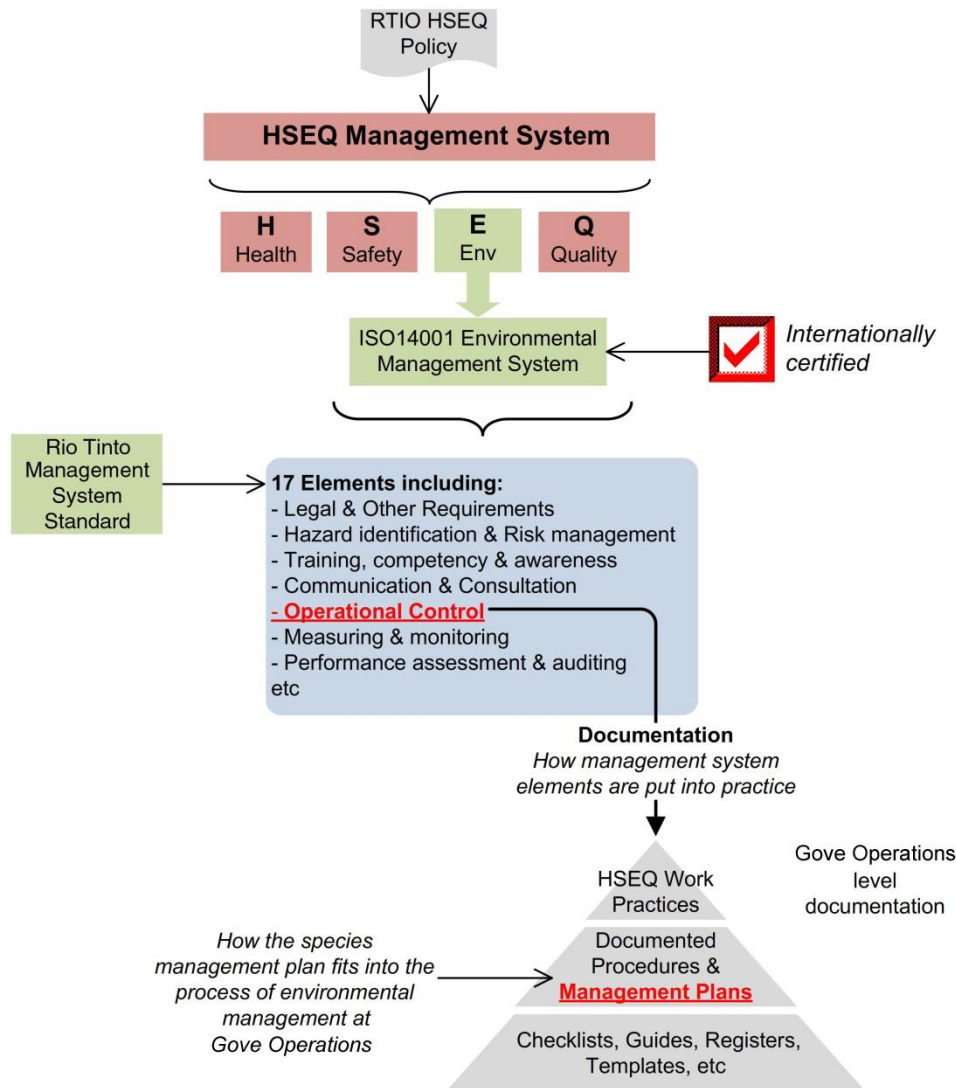


Figure 2-1 Environmental Management at Rio Tinto Gove Operations. HSEQ = Health, Safety, Environment and Quality.

3 SPECIES' ECOLOGY

3.1 BACKGROUND

The Black-footed Tree-rat (*Mesembriomys gouldii*) is a medium-sized mammal inhabiting coastal and sub-coastal northern Australia. The Black-footed Tree-rat is mottled black and grey, with a very long tail (320-420mm) which has a white brush at the tip (Cole & Woinarski 2002; Rankmore & Friend 2008). The body is 260-320mm from the nose to the base of the tail (**Figure 3-1**).



Figure 3-1 Photo of Black-footed Tree-rat

Little is known about the species' biology and ecological requirements. What is known is generally based on anecdotal observations, small sample sizes and/or few geographic locations. Black-footed Tree-rats are nocturnal, relatively non-social, arboreal, and use tree hollows as shelter sites during the day (Griffiths *et al.* 2002; Crichton 1969).

Medium-sized (35-5500g) Australian mammals have undergone catastrophic population crashes in the past century (Woinarski *et al.* 2001). Weighing between 330 and 990g (Cole & Woinarski 2002; Morton 1992), the Black-footed Tree-rat falls within this susceptible size category. The species is the largest of the Australian rodents and one of two species of tree-rats, both of which have limited distributions (Lee 1995; Woinarski and Burbidge 2016).

3.2 DISTRIBUTION

The Black-footed Tree-rat has a fragmented distribution across northern Australia, from Mackay to the Mitchell Plateau of northern Western Australia (Woinarski and Burbidge 2016). Three subspecies are recognised: *M. g. gouldii* inhabits the mainland Northern Territory and Western Australia, *M. g. rattoides* inhabits north-eastern Queensland, and *M. g. melvillensis* is confined to Melville Island in the Northern Territory.

The historical range of the Black-footed Tree-rat extended inland towards the Daly River region in the Northern Territory, although the current range is thought to have receded from these areas (Lee 1995). In the 1980s, the species was abundant across the open eucalypt forests of coastal and subcoastal Northern Territory. Over the subsequent 10-20 years, the Black-footed Tree-rats largely disappeared from extensive areas of Kakadu National Park (Friend and Taylor 1985; Woinarski *et al.*

2001) and Litchfield National Park (Woinarski *et al.* 2004a), where studies were monitoring population trends. Even at sites where the species remained common into the early 2000s (e.g., rural areas around Darwin), 60% declines occurred between 2001 and 2011 (Threatened Species Scientific Committee 2015).

3.3 HABITAT

The habitat requirements of Black-footed Tree-rats are not well known. What is known is generally based on anecdotal observations, small sample sizes and/or few geographic locations. Some studies have suggested trends for certain habitat characteristics to be related to trap rates, although these findings are rarely replicated by other studies and the overall evidence for most environmental relationships remains weak.

The Black-footed Tree-rat inhabits open eucalypt woodland and forests (Friend & Taylor, 1985; Rankmore & Friend, 2008). The prevalence of this broad habitat type across northern Australia conflicts with the apparently patchy distribution of Black-footed Tree-rats, indicating that the species has more specific habitat requirements than are currently known.

Studies that have examined correlates of tree-rat densities have identified potentially important habitat requirements. On Melville Island, Black-footed Tree-rats inhabit a broad range of vegetation types, but appear to show weak preferences for eucalypt-dominated woodlands and forests (Firth *et al.* 2006). Variables closely associated with the presence of Black-footed Tree-rats were proximity to watercourses and elevation, with low-lying sites away from water being favoured (Firth *et al.* 2006).

In Kakadu National Park, the species appears to favour drainage areas where there is a dense and diverse shrubby understorey, and taller canopy (Friend and Taylor 1985). Favoured habitats tend to be burnt less frequently than non-favoured habitats (Friend and Taylor 1985). These conclusions were based on comparing a single drainage area with a single elevated area, and therefore have weak empirical support. Furthermore, no specific structural attributes of the forest were associated with the presence of the species (Friend and Taylor 1985; Firth *et al.* 2006); however, hollows in dead and living trees are important as denning sites (Griffiths *et al.* 2002).

Studies in the Darwin region failed to find any relationships between the abundance of Black-footed Tree-rats and habitat variables including fire regime, canopy cover and weed abundance (Rankmore 2006). The area of habitat fragments is, however, important; the species was absent from habitat fragments less than 1 ha in area (Rankmore 2006). Species richness of woody, fruiting midstorey trees was positively, but not significantly, correlated with abundance of Black-footed Tree-rats (Rankmore 2006). Of the 20 species of fruiting trees assessed, three (*Bridelia tomentosa*, *Exocarpos latifolius* and *Petalostigma pubescens*) showed significant positive associations with Black-footed Tree-rats (Rankmore 2006).

Studies near Darwin suggest that most denning sites of Black-footed Tree-rats are in hollow limbs of *Eucalyptus tetradonta* or dead trees, although other hollow tree species may be used, as well as the dense foliage of *Pandanus spiralis* or the palm, *Carpentaria acuminata* (Braithwaite 1989; Griffiths *et al.* 2002; Rankmore 2006). The average diameter at breast height of *E. tetradonta* that contain denning sites is 42 cm (Griffiths *et al.* 2002; Rankmore 2006), and the average height of these trees is 17.7 m (Griffiths *et al.* 2002). Individual Black-footed Tree-rats utilise multiple den sites within their home range, moving regularly between them (Griffiths *et al.* 2002).

A large-scale occupancy model undertaken at Gove in 2015 found tree-rats in approximately one-third of the Gove mining lease (MET Serve 2016a). One of the major environmental covariates predicting the distribution of Black-footed Tree-rats was vegetation density measured from satellite imagery, with the densest forests favoured. Forests within 1 km of permanent water were less favoured than those further away. Rehabilitated sites were widely utilised, even as young as 6 years old, although remnant forests were occupied to a greater degree. Forests on the bauxite plateau tended to be occupied at higher rates than those in the alluvial flats. Other variables that were moderately related

to high occupancy by tree-rats included a low amount of clearing within the sample cell, rudisol soils and a longer time since fire. These are discussed further in **Section 4.3**.

3.4 REPRODUCTION

Breeding occurs throughout the year, but is most pronounced during August and September (Friend 1987; Rankmore 2006). Pregnancy lasts 43-44 days and the young are born well-developed (Crichton 1969). Litter size of the species is small; between one and three pups are born, and weaned around 42 days (Crichton 1969). At around 80 days, individuals are considered to be of adult size and condition (on average, approximately 580g for females and 650g for males) (Friend 1987; Rankmore 2006). Females are able to breed at approximately nine-month intervals (Friend 1987).

3.5 DIET

Little is known about the diet of the Black-footed Tree-rat, although associations with certain food plants have been reported (Friend & Taylor 1985; Morton 1992). Large seeds, particularly of *Pandanus* sp., are probably a major food source (B. Rankmore, pers. comm. July 2012). Other food items that have been identified include other fruits, seeds, nectar (e.g. *Grevillea* spp.) and invertebrates (including molluscs) (Watts 1977; Rankmore, 2006).

An analysis of four scats collected in 1987 found all contained remnants of fruits and flowers (Morton 1992). Grass and invertebrates were found in much smaller amounts and may comprise a smaller part of the diet. Although the sample size was limited, termites and other insects were identified, which may or may not be an important seasonal aspect of the diet for the rodent (Morton 1992; Calaby 1983). This diet resembles the diet of the only other Australian tree-rat, the Golden-backed Tree-rat (*Mesembriomys macrurus*) (Morton 1992).

At Gove, gnaw marks from Black-footed Tree-rats have been observed on the seeds or hard fruits of *Brachychiton diversifolius*, *Brachychiton paradoxus*, *Corymbia ferruginea* and *Planchonia careya* (MET Serve 2016a). A large number of other plant species are probably also eaten.

3.6 MOVEMENTS

For their size, Black-footed Tree-rats are thought to have relatively large home ranges (Griffiths *et al.* 2002; Rankmore 2006). Through the long-term use of a trapping grid, Friend (1987) found that when individuals were caught on successive nights, they moved a mean distance of 92 m (range 40-200 m). The maximum distance between any two captures of the same individual was 580 m. Similar results were obtained when radio-tracked individuals were followed to their dens (Griffiths *et al.* 2002). The mean distance tree-rats moved between den sites was 72 m, and the maximum distance moved in a single day between den sites was 174 m. Individuals covered an activity area (area containing dens utilised) of 7.3-18.2 ha over a three-month period (Griffiths *et al.* 2002). With a larger sample size, Rankmore (2006) found some individuals with very large activity areas, up to 40.4 ha, although the median of 6.5 ha resembled the findings of Griffiths *et al.* (2002). The foraging areas, however, extend far beyond the boundaries of the area containing the dens. These foraging areas ranged from 9.11 ha to 88.16 ha in size (Rankmore 2006).

Taken together, available data suggest that Black-footed Tree-rats typically roam about 100-300 m per night, and occupy a home range with an approximate radius of 150-350 m.

Territories overlap, although it is unknown to what extent.

3.7 KNOWN THREATENING PROCESSES

No single threatening process is implicated in the decline of the Black-footed Tree-rat, although a combination of factors is likely to be involved. An altered fire regime throughout tropical ecosystems in northern Australia has probably had a substantial effect on several medium-sized mammals, including the Black-footed Tree-rat (Woinarski *et al.* 2011).

Too frequent or intense fires are widely thought to be one of the major threats to Black-footed tree-rats (Threatened Species Scientific Committee 2015), as fires remove woody, fruit- and seed-bearing midstorey vegetation important for food, destroy hollows and expose tree-rats to elevated levels of predation.

Evidence for the importance of fire regime to Black-footed Tree-rats is, however, very weak. A study by Friend and Taylor (1985) showed a weak positive association between Black-footed Tree-rat capture rate and the woody plant species, *Corymbia clavigera*, *Gardenia megasperma*, *Terminalia ferdinandiana* and *Planchonia careya*. As these are large-fruited, midstorey species that are removed by regular fire, this was considered tentative evidence for a role of fire regime in determining the distribution of food resources. However, this same study failed to find a relationship between tree-rat capture rate and vegetation structure (e.g., canopy, midstorey and understorey density), attributes that are much more directly related to fire regime than is the presence of a select few plant species. Furthermore, fire can promote the establishment of some of these species (e.g., *P. careya*: Russell-Smith *et al.* 2003).

Stronger evidence for fire having a detrimental effect on Black-footed Tree-rats was presented by Woinarski *et al.* (2004b). They found that tree-rat capture rates were higher in a 120-ha block of eucalypt forest that had gone unburnt for 23 years than in surrounding forest that was burnt annually. Even in this case, however, there was relatively weak evidence for the overall relationship (p-value between 0.01 and 0.05). Given that the findings were based on comparisons between a single unburnt site and a single annually burnt site, and that the differences in fire regimes tested are far more extreme than is generally present in nature, it is unclear how relevant these findings are to explaining general patterns of tree-rat distribution.

On a more representative sample of forest sites with varying fire regimes, Firth *et al.* (2006) found weak relationships between the capture rates of Black-footed Tree-rats and time since last fire and fire impact scores. Furthermore, these relationships were opposite to predictions; tree-rats were more often recorded in habitats burnt most recently and habitats with higher fire impact scores.

Rankmore (2006) failed to detect any associations between fire regime and abundance of Black-footed Tree-rats, although fire frequency was related to the diversity of woody fruiting trees and shrubs, which was weakly correlated to tree-rat abundance.

The occupancy model undertaken at Gove in 2015 produced equally weak support for a relationship between fire and tree-rat distribution. The fire variables considered (time since fire, early and late fire frequency) did not explain much variation in the distribution of Black-footed Tree-rats (MET Serve 2016a). However, fire regime was related to vegetation density, which was a powerful predictor of occupancy by tree-rats. Sampling cells that experienced a low frequency of fires had a higher mean probability of occupancy by Black-footed Tree-rats (MET Serve 2016a). This negative relationship was especially pronounced when late fires (after September) were considered separately, such that regular late fires were detrimental to Black-footed Tree-rats. Frequency of early fires (before October) appeared to have less of an impact on tree-rat presence, consistent with the lower presumed intensity of such fires (Russell-Smith *et al.* 2003). Interestingly, the expected catastrophic consequences of late fires at sites with low fire frequencies, and presumably higher fuel loads, were not observed. In fact, infrequently burnt sites were more often utilised by Black-footed Tree-rats when occasional fires were late rather than early (MET Serve 2016a). It is possible that heavily overgrown, long-unburnt sites may benefit from occasional high-intensity fires that stimulate regeneration of some woody species. A frequency of one fire every seven to eight years was associated with vegetation densities optimal for habitation by tree-rats (MET Serve 2016a). Fires lit at such infrequent intervals are best carried out late in the dry season (after September). At sites where fire exclusion is not possible (e.g., publicly accessible areas), early fires lit every two to three years are preferable to late fires (MET Serve 2016a).

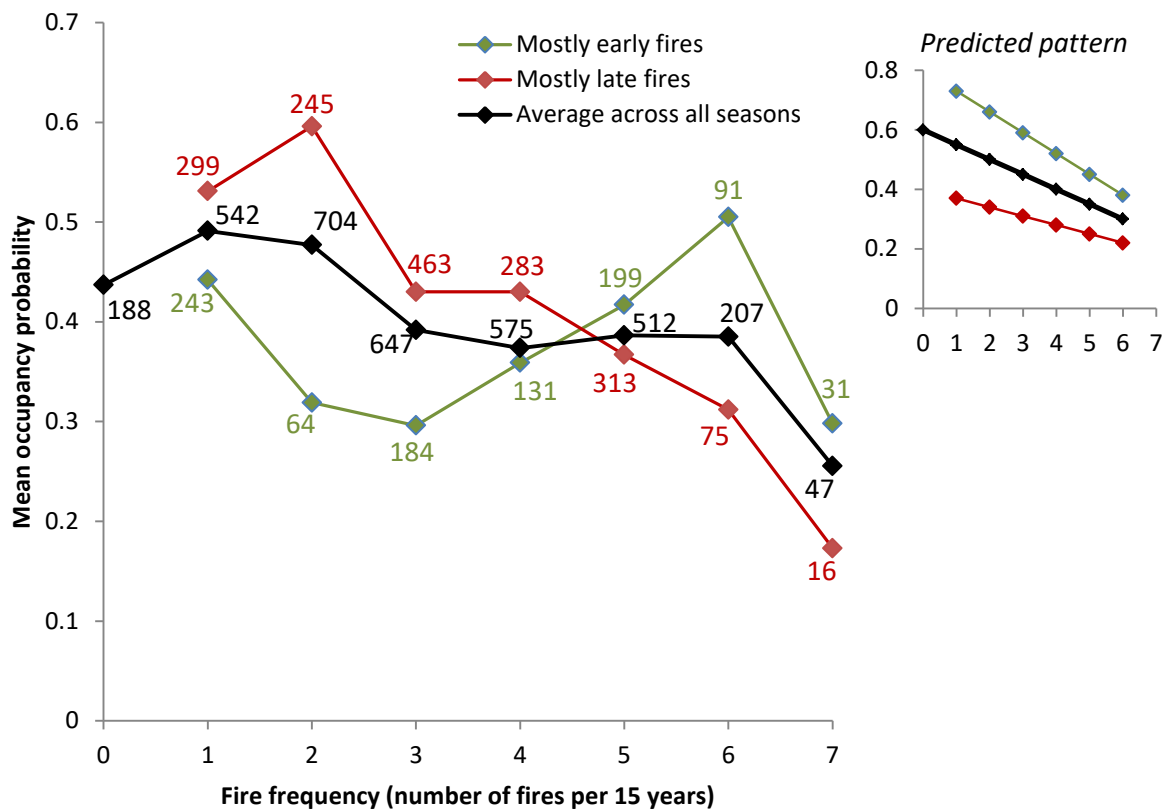


Figure 3-2 Effects of fire frequency and timing on the probability of occupancy of sampling cell by Black-footed Tree-rats. Data comes from surveys and models undertaken at Gove in 2015 (MET Serve 2016). This is described further in **Section 4.3**. Sample sizes refer to the number of sampling cells for which each mean probability was calculated. Only remnant forests are included. The right panel shows the predicted pattern if high fire frequencies reduce habitat suitability for tree-rats, late fires are more destructive than early fires, and the destructiveness of late fires is exacerbated by the high fuel loads associated with low overall fire frequencies.

Beside fire, other threats to Black-footed Tree-rats include habitat fragmentation, large-scale vegetation clearing and introduced species (Lee 1995; Braithwaite and Muller 1997; Woinarski *et al.* 2010; Woinarski *et al.* 2011). Black-footed Tree-rats can move 700 m across open areas to reach habitat, and appear to be resilient to low-moderate levels of habitat fragmentation (Rankmore 2006). Nevertheless, excessively cleared landscapes do not support tree-rats, and the species is absent from habitat fragments less than 1 ha in area (Rankmore 2006). Grazing species, such as cattle and water buffalo may cause destruction of important food plants for the Black-footed Tree-rat. The feral cat is implicated in predation.

4 GOVE POPULATION

4.1 BACKGROUND

There are a small number of historical records of Black-footed Tree-rats from the Gove Peninsula (Atlas of Living Australia 2013). Six personal observations and a preserved specimen were recorded between 1936-1948. Of these, two were sighted at Yirrkala lagoon, two near Cape Arnhem and three at the western edge of the mining lease, on the upper reaches of a tributary to the Latram River (Atlas of Living Australia 2013). Over the subsequent 65 years, there were no confirmed records of the species from the Gove Peninsula, coincident with large-scale population declines noted elsewhere within the species' distribution.

The species was rediscovered on the Gove mining lease in 2008, during pre-clearing surveys of the Rocky Bay region. Based on recommendations by Government at the time (the species then held a Near Threatened status (see **Section 3.2**)), a disturbance exclusion zone was established around this tree-rat population (Woinarski *et al.* 2008). The size of this exclusion zone was based on the limited information about the species available at the time. This involved estimations about the food and habitat requirements for a minimum-sized population (ten individuals), whereby two individuals shared an average home range of 40 ha. This determined a minimum exclusion zone of 200 ha. This exclusion zone remains in effect today.

Targeted surveys for Black-footed Tree-rats in 2012 revealed a relatively large population (13 captures involving 11 individuals) inhabiting the Rocky Bay area where they were first detected (MET Serve 2012). Furthermore, annual pre-clearing surveys of forest blocks planned for drilling have detected large numbers of Black-footed Tree-rats over the past few years. A total of 14 captures occurred in 2013-2014 (MET Serve 2013; 2014a), 22 captures in 2014-2015 (MET Serve 2015) and three more were captured in 2015-2016 (MET Serve 2016b). In one of the forest blocks surveyed in 2014/2015, the trapping rate was among the highest ever recorded for the species (15.8 per 100 trap-nights: MET Serve 2015). Long-term monitoring of vertebrates recolonising rehabilitated mined areas undertaken in 2015-2016 resulted in five captures of Black-footed Tree-rats in rehabilitated areas older than ten years.

These recent captures greatly expanded the known extent of the population inhabiting the Gove mining lease, and raised questions regarding the potential impacts on the species of planned vegetation clearing for drilling and mining activities.

4.2 SAMPLING EFFORT 2007-2015

4.2.1 Pre-clearing Surveys

To fulfil a condition of mining approval, Rio Tinto surveys all areas earmarked for future mining for species of conservation significance. As part of these surveys, cage traps are installed at all survey sites, which is the recommended approach for surveying medium-sized mammals (DSEWPAC 2011). Cage traps are collapsible (usually) wire/netting mesh boxes, which have a treadle-operated closing mechanism. Animals are lured into the traps by bait placed inside. The Havahart model PTS1089 cage trap (325 mm high x 265 mm wide x 805 mm long) has been used successfully at Gove (e.g., MET Serve 2012; 2013). The type of bait used is a peanut butter and oat mixture (Scotts & Craig 1988).

Four cage traps are installed at each pre-clearing survey site (one in each corner of a 50 m x 50 m quadrat), and traps are open for three consecutive nights in the wet season and three additional nights in the dry season.

Since 2008, 1,920 trap-nights of cage trapping have been undertaken during pre-clearing surveys (**Table 4-1**).

Table 4-1 Cage trapping search effort during pre-clearing surveys

Pre-clearing Survey	Search effort (trap-nights)	Capture rate (tree-rats per 100 trap-nights)
2007	276	0
2008	720	0.28
2012	288	0
2013	312	4.49
2014	312	7.06
2015	288	1.74

4.2.2 Long-term Rehabilitation Monitoring

Approximately every five years, Rio Tinto Gove Operations undertakes ecological surveys of rehabilitated mined areas to monitor their development towards target ecosystems. This long-term rehabilitation monitoring includes the cage trapping methods used for pre-clearing surveys (i.e., four cages per site open over three nights per season). No Black-footed Tree-rats were recorded in rehabilitated areas in 2006-2007. However, five tree-rats were captured in rehabilitated sites in the 2015-2016 monitoring period. All captures were in sites older than ten years.

Since 2007, 984 trap-nights of cage trapping have been undertaken during long-term rehabilitation monitoring (**Table 4-2**).

Table 4-2 Cage trapping search effort during long-term rehabilitation monitoring

Rehabilitation Survey	Search effort (trap-nights)	Capture rate (tree-rats per 100 trap-nights)
2006-2007	348	0
2015-2016	636	0.79

4.2.3 Targeted Trapping

In addition to pre-clearing surveys and long-term rehabilitation monitoring, both of which are general fauna surveys, three surveys have targeted Black-footed Tree-rats using intensive cage trapping in certain parts of the mining lease where they had previously been recorded. The purpose of these targeted surveys was to get an indication of the population densities in these areas.

The first targeted survey, in the vicinity of Rocky Bay in April 2012, involved cage traps installed along eight parallel transects, separated by 250-500 m. Each transect was 500 m long, consisting of 10 traps spaced equidistantly. Each transect was open for four nights. Captured individuals were marked with a Passive Integrated Transponder tag (PIT tag), inserted subcutaneously on the dorsal surface of the neck.

Two further targeted surveys were undertaken within the drainage flats of the upper Latram River and Rocky Bay Creeks in March 2014. At each site, 64 cage traps were installed in a grid that spanned 28 hectares. Rather than using invasive PIT tags, captured tree-rats were marked with food colouring painted onto their white tail in order to identify re-captures.

The results of these targeted surveys are summarised in **Table 4-3**.

Table 4-3 Cage trapping search effort during targeted surveys

Site	Year	Search effort (trap-nights)	Capture rate (tree-rats per 100 trap-nights)	Estimated density*
Rocky Bay (Mine area 10-7)	2012	320	4.06	One per 9.5 ha
Rocky Bay Creek (Mine area 9-11)	2014	192	5.21	One rat per 2.8 ha
Upper Latram River (Mine area 3-9)	2014	192	3.13	One rat per 7 ha

*Note that estimates of density assume that all Black-footed Tree-rats within the trapping grid were captured, which is highly unlikely. They should therefore be viewed as conservative minimum estimates of density.

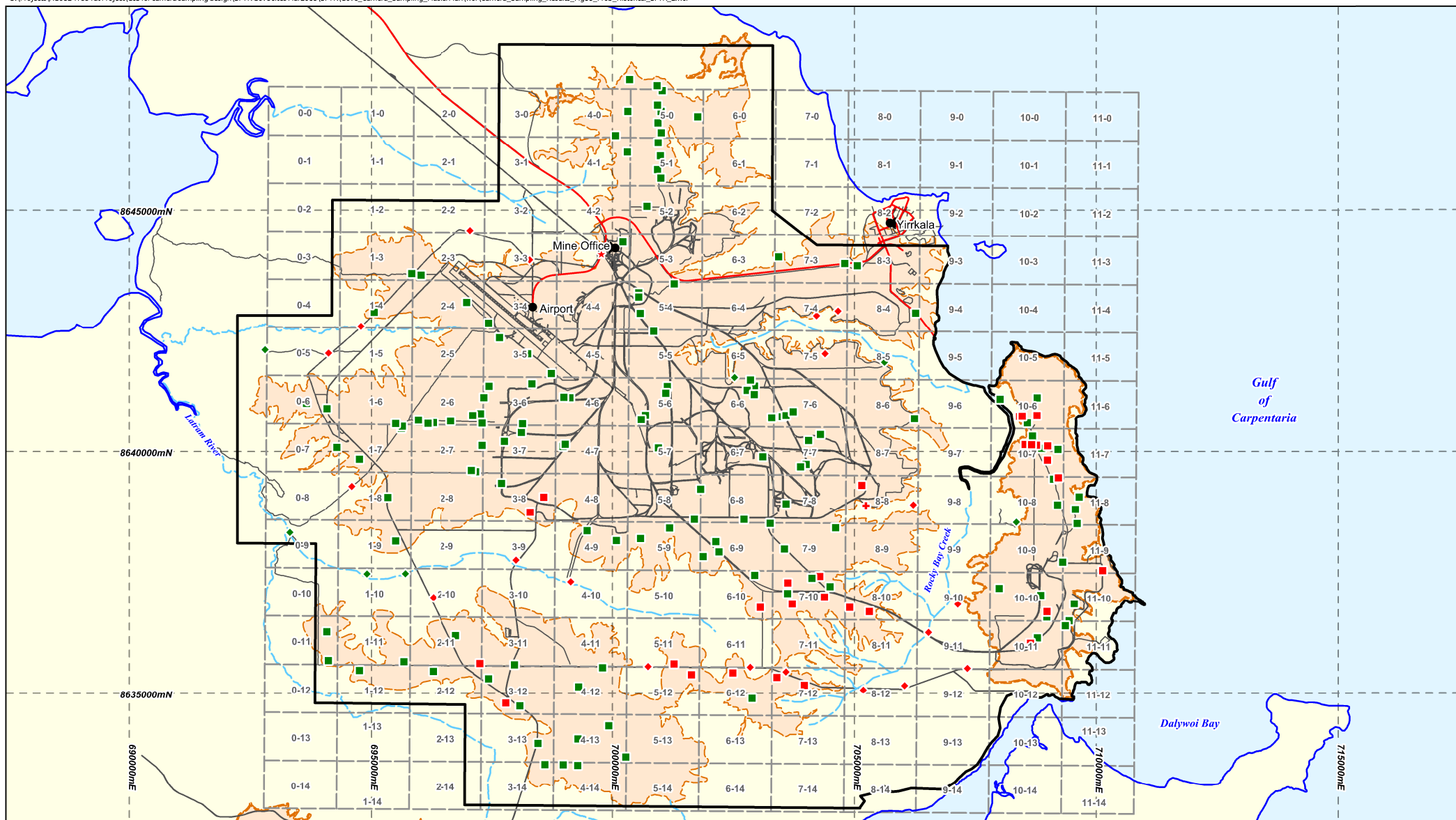
4.2.4 Remote-sensory Cameras

Between November 2013 and June 2014, remote-sensory infrared cameras were trialled on the Gove Operations mining lease to examine connectivity of known populations. RECONYX Hyperfire HC500™ cameras were installed in riparian locations in most of the catchments in the mining lease, in sites not previously subjected to survey effort. While it is not possible to infer population densities using cameras (individuals cannot be distinguished), cameras represent a cheaper, easier and less intrusive method for detecting presence/absence of tree-rats, compared with trapping. Cameras were mounted to trees approximately 1.5 m above the ground. They were angled toward the ground approximately 30°. The area in front of each camera (approximately 2 x 2 m) was raked of leaves, and vegetation was pruned away. This minimises fire risk to the camera and the number of false triggers due to vegetation moving in the wind. One kilogram of mixed nuts (walnuts, almonds, peanuts, cashews) was spread in each camera's field of view, as well as a jar of peanut butter. The latter was dolloped in table-spoon-sized clumps.

Many cameras, and their elastic ties used for attachment to trees, were initially damaged by gnawing tree-rats. This can expose the cameras to water damage and/or dislodge cameras from their trees. To prevent this, RECONYX HyperFire Security Boxes™ were fitted to each camera, and single-strand steel wire (2.5 mm diameter) was used to attach the boxes to trees.

Cameras were left to operate for three weeks, although many stopped recording prematurely due to faulty batteries or (mostly) because tree-rats had dislodged the cameras via gnawing through the elastic ties. Data from at least one week of recording was obtained from 24 camera sites. Black-footed Tree-rats were recorded at 18 (75%) of these. Tree-rats were recorded within every catchment surveyed.

The locations of all records of Black-footed Tree-rats within the Gove mining lease prior to the 2015 occupancy model are shown in **Figure 4-1**.

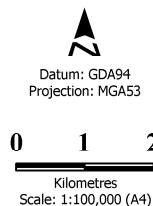


Rio Tinto

METSERVE
Mining & Energy Technical Services Pty Ltd

- Locality
- Remote Sensory Camera Sites
 - ◆ BFTR Observed
 - ◆ BFTR Not Observed
- Cage Trapping Sites
 - BFTR Captured
 - BFTR Not Captured
- Incidental Observations
 - ★ BFTR Observed
 - ★ Road Fatality
- Watercourse
- Mining Lease
- Transport
 - Road
 - Access Track

Data Source: Historical Captures, Probability - METServe 2015; NDVI - Mipela GeoSolutions 2015; All other data - GOPA 2014.



RT Gove Operations Black-footed Tree-rat records between 2008 and 2016 on the Gove Operations mining lease

01/06/2018

FIGURE 4-1

4.3 OCCUPANCY MODEL 2015

4.3.1 Background

The spate of recent records of Black-footed Tree-rats along the southern edge of the bauxite plateau (during pre-clearing surveys) and within the drainage flats (during targeted surveys and the camera study) raised the question of whether there has been a recent local population expansion, or whether the sites surveyed most recently happened to represent core habitat for the species. The former hypothesis is not unprecedented; an 8-fold increase in population density was observed over 14 months in 1981 in Kakadu, only for the species to disappear one year later (Friend 1987). This suggests that the species is highly susceptible to fluctuations in food supply, driven by variation in the amount and timing of rainfall (Friend 1987). The two scenarios, a temporary population boom versus highly localised pockets of core habitat, have drastically different implications for predicting the impact of mining where tree-rats have been recently detected. To disentangle these two hypotheses, a survey of the entire mining lease was undertaken simultaneously in order to develop an occupancy model that identifies locally important habitats for the species. The methodology and results of this survey is described in detail by MET Serve (2016a). This is summarised in the following subsections.

4.3.2 Occupancy Models

Ecological surveys, especially those that target species that are difficult to detect using standard survey methods, have to deal with the problem of imperfect detectability. Lack of detection does not necessarily imply absence. Occupancy models are a statistical tool developed to overcome the limitations of imperfect detection when ecological surveys endeavour to map the distributions of wildlife (MacKenzie *et al.* 2002, 2006). Occupancy models use repeated sampling of sites to calculate detectability, and take this into account when estimating probability of occupancy.

The general approach used for generating occupancy models is as follows (MacKenzie *et al.* 2002, 2006). First, the entire area of interest is divided into assessment units, such as a grid. Second, environmental variables that potentially underlie the distribution of the species are measured at each assessment unit. A subset of the assessment units are then chosen as survey locations for repeated sampling of the presence/absence of the species of interest. The selection of survey locations should ensure that sufficient sampling of all habitat types occurs and that extremes, with respect to the variables of interest, are included (MacKenzie *et al.* 2006).

The data obtained from the surveys are in the form of a detection history for each site, which can be converted into mathematical statements. The product of all the mathematical statements (one for each possible detection history) forms the model likelihood for the observed data, and maximum likelihood estimation can be employed to estimate model parameters. Estimates of the parameters, ψ (occupancy) and/or p_j (probability of detection during the j th survey) can be related to environmental variables using the logit-link function. To determine the environmental factors that best predict the presence/absence of the species and the detection probability, the Akaike Information Criterion (AIC) is used to infer the most parsimonious combination of parameters that explain the most variation in the data (MacKenzie *et al.* 2002, 2006).

The relationships between the environmental parameters and occupancy are then used to extrapolate the distribution of the species across all assessment units within the area of interest.

Occupancy models depend on several assumptions:

- 1) there is repeated sampling at the same site;
- 2) occupancy doesn't change across the repeat sampling of each site;
- 3) the probability of occupancy is constant across sites, or differences in occupancy probability are modelled using covariates;
- 4) the probability of detection is constant across all sites and surveys or is a function of site-survey covariates;
- 5) the species is never falsely detected; and

- 6) detection at a site is independent of detection at other sites.

The software package PRESENCE is widely used to perform occupancy analyses, and has the ability to perform models where detectability is constant across all sites, or detectability varies with environmental variation.

4.3.3 Sampling Methodology

Between May and August in 2015, 240 remote-sensory cameras were deployed across the entire mining lease. Based on the success of the pilot study summarised in **Section 4.2.4**, cameras were deemed to be the most cost-effective means of surveying large numbers of sites for the presence of Black-footed Tree-rats. Reconyx HyperFire HC550 White Flash cameras were set up to take three consecutive photos, one second apart, per trigger. There was a 15-second delay after each three-photo batch before the camera could be triggered again.

Occupancy modelling, which requires repeated sampling of each site, offers a very useful analytical framework for analysing data collected from motion-activated cameras. This is because each camera can gather repeated samples (each day or week can be treated as a single sampling occasion) without the need for additional investment in labour and resources.

Because the sampling occasions occur back-to-back, the assumption that occupancy remains static throughout the duration of sampling is less likely to be violated. Furthermore, detection probabilities are expected to remain relatively stable, another assumption of occupancy models, due to the fact that the instalment of motion-activated cameras can be standardised and readily replicated.

One final assumption of occupancy models is that the species is never falsely detected. Pilot studies confirmed that Black-footed Tree-rats are easily identified in photos taken by motion-activated cameras and their large size and diagnostic white-tipped, bushy tail mean that the species is highly unlikely to be confused with sympatric species.

Cameras were each placed in a Reconyx HyperFire Security Enclosure, a steel box that prevents damage to the plastic camera case from gnawing tree-rats. Pilot trials with cameras lacking these enclosures found that gnawing tree-rats regularly destroyed the waterproof plastic casing around the cameras.

Cameras were positioned on the trunks of trees, 70 cm from the ground. Only trees with a diameter >10 cm were used, as smaller trees frequently swayed in the wind, leading to excessive false triggers. Where trees were not available (in young rehabilitation sites), star pickets were used to support cameras. A bait station was positioned 2 m in front of each camera. Each bait station comprised a 100 mm length of PVC pipe, with a waterproof cap and a vented base. Bait, consisting of a 3 cm diameter ball of peanut butter and oats, was placed in each pipe. The bait station was attached to a fence dropper, which was hammered into the ground. The entire area between the camera and bait station was cleared of vegetation and leaf litter, to reduce false triggers caused by swaying vegetation and the risk of fire destroying the cameras. Each camera was angled slightly downwards so that the bait station was positioned centrally in the field of view.

Each camera was operational for 28 nights per site, and each four-night period was treated as a single sampling occasion, with seven consecutive sampling occasions per site.

The locations of cameras were chosen by dividing the entire Gove mining lease into 200 m x 200 m grid cells. Cells containing habitats other than *Eucalyptus tetradonta* and/or *Eucalyptus miniata* forests, or rehabilitated mined areas that support early developmental stages of these communities, were excluded from analysis, and assumed to be vacant. Of the remaining 4,215 cells, those to be sampled were selected based on a stratified random sampling design. This ensured that 70 cameras were installed in remnant forests off the bauxite plateau, 70 were installed in remnant forests on the bauxite plateau, and 20 were installed in each of five age-classes of rehabilitation.

The following environmental data were obtained for each of the 4,215 cells within the mining lease:

- vegetation density, based on the Normalised Difference Vegetation Index (NDVI) calculated from Landsat 8 satellite imagery;
- percentage of the cell that is cleared (percentage of each cell with an NDVI <0.3);
- soil type based on the ASRIS Level 4 Australian Soil Classification mapping;
- fire frequency over the past 15 years, based on the North Australia Fire Information database;
- time since the last fire, based on the North Australia Fire Information database;
- frequency of early (before October) fires over the past 15 years, based on the North Australia Fire Information database;
- frequency of late (after September) fires over the past 15 years, based on the North Australia Fire Information database;
- position on or off the bauxite plateau;
- vegetation age, based on rehabilitation records; and
- position closer or further than 1 km from permanent fresh water.

Occupancy models were fitted to determine the relative importance of each of these environmental covariates for predicting tree-rat presence. The probability that each of the cells within the mining lease is occupied was then calculated based on the environmental attributes of those cells.

4.3.4 Key Findings

The detectability of Black-footed Tree-rats was high (97.9%) when cameras were deployed for four weeks. Detectability was higher in the first half of the sampling period than in the second half, presumably because fresh baits are more attractive. Distance between the camera and the bait, and the central position of the bait within the camera's field of view also influenced detectability of Black-footed Tree-rats.

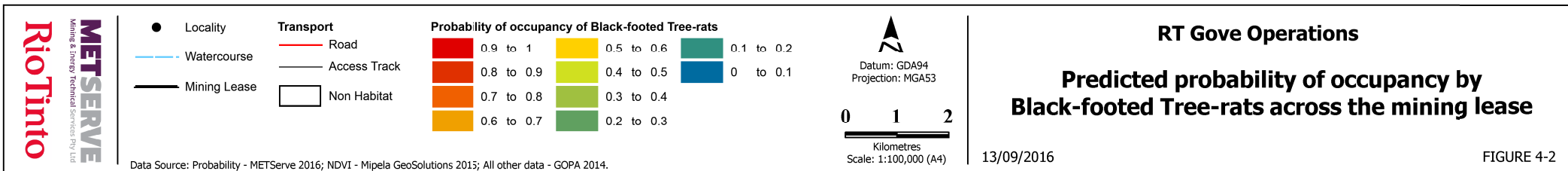
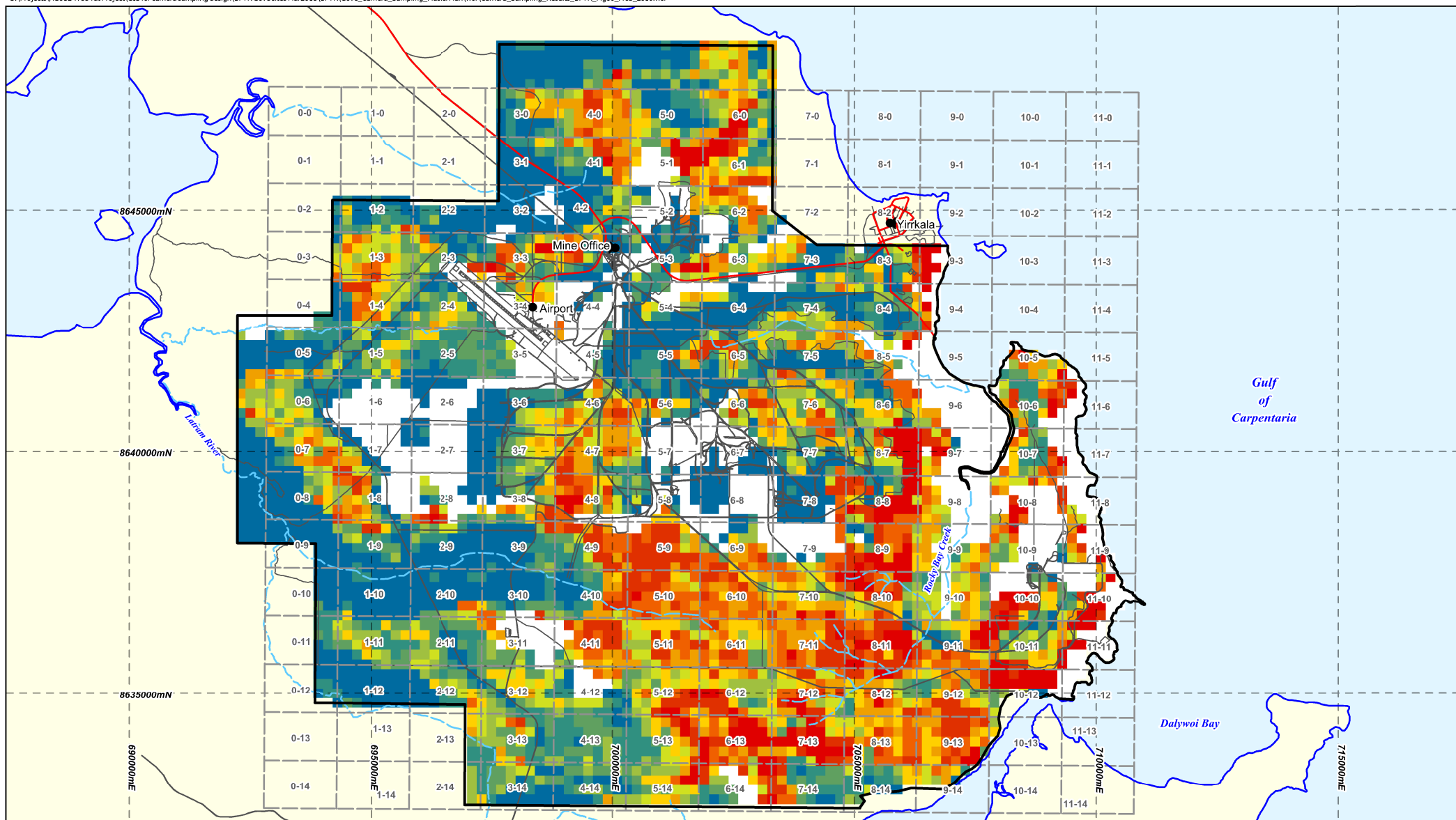
The occupancy model predicted that 32.25% (95% CI = 20.02-47.07%) of the mining lease was occupied by Black-footed Tree-rats. Data partitioning revealed that models based on a subset of the data were generally good at predicting occupancy in the remaining cells, suggesting that the models were valid. Sites were more likely to be occupied by Black-footed Tree-rats if these:

- have a high vegetation density;
- are further than 1 km from water;
- are remnant vegetation;
- are on the plateau;
- have a rudisol soil type;
- are in cells that have a large proportion of clearing; and/or
- have gone longer since the last fire.

The first four environmental variables above had the strongest effect.

The south-eastern quarter of the mining lease was consistently found to support the largest, most connected population of Black-footed Tree-rats (**Figure 4-2**). This population occurs both on the plateau and within alluvial flats, and extends from remnant forests to rehabilitated mined areas. Western areas generally had the lowest probability of occupancy, especially along the Latram River. The models predict that in areas north of Yirrkala Road and west of the Arnhem Highway, habitat favoured by Black-footed Tree-rats occurs patchily. The fragmented nature of this habitat may reduce its utilisation by tree-rats, a potential reason for why so few past records of Black-footed Tree-rats have come from these areas.

The camera study detected Black-footed Tree-rats in rehabilitated sites of all ages older than five years. Occupation of rehabilitated sites increased progressively over the first 30 years of vegetation development. Patterns of recolonisation are discussed further in **Section 4.5**.



Despite not being a strong predictor of tree-rat presence, fire regime appeared to influence vegetation density, which is one of the key environmental variables predicting the distribution of Black-footed Tree-rats. Optimal fire regimes are discussed in **Section 4.6**.

4.3.5 Future Predictions

Rio Tinto plans to continue mining its Gove lease for at least 10-15 more years. This will involve the staged clearing and mining of most remnant forest habitats remaining on the bauxite plateau, including areas that currently support Black-footed Tree-rats, as revealed by the occupancy model. The removal of tree-rat habitat will occur simultaneously with the creation of new habitats as rehabilitated areas mature and new rehabilitated areas are established.

In order to predict how the future removal and addition of habitat will affect overall tree-rat abundance at Gove, it was necessary to project the changes in environmental values for each cell. This was achieved by overlaying the 4 ha grid system used for occupancy modelling over the current 15-year mine plan to determine which cells are going to change status over the next ten years.

These were incorporated into occupancy models to forecast changes to the Black-footed Tree-rat population at Gove over the next ten years. This revealed that the proposed clearing of forest habitat for mining activities over the next ten years is expected to be almost completely compensated for by the anticipated improvements in tree-rat habitat achieved through the continued development of rehabilitated areas. In fact, a net increase in occupancy across the mining lease could arise if the conservative assumptions about rehabilitation older than 30 years declining in habitat value are not valid.

The future distribution of tree-rats predicted by the model assumes:

- 1) that the fire regime, and therefore vegetation density, remains unchanged in remnant forests; and
- 2) that there are no large-scale changes to the Black-footed Tree-rat population independent of mining operations.

There is no reason to expect fire regimes to change drastically in the foreseeable future at Gove. Any changes would be due to active fire management by the mine and, as the fire management plan would be driven by the desire to protect habitat for wildlife, prescribed fire regimes would remain benign. There is, however, the possibility that tree-rat populations may undergo regional-scale fluctuations over this period. Such fluctuations could be driven by poor fruit-set in years of low rainfall, or temporary booms in the populations of feral cats and/or other predators. It is possible that the distribution of key habitat for Black-footed Tree-rats could change under bad versus good conditions. This could potentially occur if one or more key food plant species only seed in wet years, while others only seed in dry years. If these hypothetical plant species are distributed differently across the mining lease, the utilisation of the lease is expected to vary under the two environmental conditions. The potential contraction or redistribution of key habitats under different environmental conditions complicates any assessment of habitat loss and fragmentation due to mining activities.

Overall, based on the data currently available from a snap-shot of the population in the dry season of 2015, the anticipated impacts of mining activities on Black-footed Tree-rats at Gove over the next ten years are negligible. Reassessment of the local population at regular intervals is recommended in order to assess how temporal variation in abundance is linked to the contraction or redistribution of habitats for the species.

4.4 POPULATION SIZE AND CONNECTIVITY

In order to effectively manage a threatened species, it is necessary to have a clear understanding of the location and connectivity of the species' population. Species with small, isolated populations are vulnerable to extinction through inbreeding, or stochastic catastrophic events. Populations that are unaffected by impacts by being located in refuges must be of sufficient size to maintain long-term viability, so that these may serve as a source for the future recolonisation of rehabilitation sites.

Both the occupancy model and previous trapping records established that the south-eastern quarter of the mining lease supports the largest, most connected population of Black-footed Tree-rats within the lease. Habitat for tree-rats also occurs patchily through the north and west of the mining lease. Despite these habitat patches being smaller than those in the south-east, they are mostly connected via narrow corridors of habitat along the plateau edge. Black-footed Tree-rats have been recorded utilising many of these areas. All available data suggest that Black-footed Tree-rats within the Gove mining lease belong to a single, connected population. This population likely continues beyond the boundaries of the mining lease, but a lack of survey effort in neighbouring areas precludes an assessment of the extent to which this occurs.

Overall, based on the occupancy model undertaken in 2015, 32.25% of the mining lease is likely to be occupied by Black-footed Tree-rats. This translates to an area of 6,547 ha of occupied habitat. The number of individuals occupying this habitat is not known, but can be roughly estimated from the results of targeted cage-trapping at three locations across the mining lease (see **Section 4.2.3**). Based on the number of individuals recorded within trapping arrays over a given area, the mean density of tree-rats recorded was one individual per 6.4 ha. Assuming that occupied habitats support this density of Black-footed Tree-rats, it is estimated that 1,023 individuals inhabit the Gove mining lease. The reliability of this estimate is considered poor. While the extent of known habitat has been well characterised through the occupancy model, it is unknown to what extent density varies across occupied habitats. Furthermore, the density estimates so far obtained were derived from only three sampling locations. These locations were sampled for only three or four days, and resulted in relatively few individuals being caught on more than one occasion. This implies that a substantial number of individuals within the sampling area went uncaptured and the density estimates are therefore highly conservative.

It is also currently unknown to what extent the Gove population's size and distribution changes temporally. Populations elsewhere are susceptible to rapid and extensive booms and declines within the space of one or two years (Friend 1987). Black-footed Tree-rats appear to be highly susceptible to fluctuations in food supply, driven by variation in the amount and timing of rainfall and recent fires (Friend 1987).

4.5 RECOLONISATION OF REHABILITATED SITES

Gove Operations has a mine rehabilitation program in place that progressively restores mined land to *E. tetradonta* and *E. miniata* woodlands resembling those naturally occurring across the mining lease. This rehabilitation program has been in operation since the 1970s, and rehabilitation sites are monitored at regular intervals to assess their structural and floristic development and suitability for fauna.

After rehabilitated sites are established, they generally comprise open, grassy habitats until approximately three years of age, when a dense shrub layer of *Acacia*, *Grevillea* and *Eucalyptus* form. At ten years old, there is a shift in dominance from *Acacia* to *Eucalyptus* as the latter begin to shade out the former. After this time, the exclusion of fire results in a gradual thickening of the midstorey with a diversity of woody plants, while at the same time a thick cover of litter tends to replace the native grassy understorey. In general, older rehabilitated sites are characterised by a density and richness of woody plants that exceeds uncleared remnant forests, at the expense of a relatively depauperate understorey plant community (Brennan *et al.* 2008; MET Serve 2014b).

There are several reasons to expect that rehabilitation sites would provide ideal habitat for Black-footed Tree-rats. Firstly, rehabilitation sites are mostly protected from fire, in contrast to most remnant woodlands in adjacent areas. Black-footed Tree-rats are often in highest densities in long-unburnt sites (Woinarski *et al.* 2004b; 2005), where there is a greater density of rainforest-associated plant species with fleshy fruits. Secondly, rehabilitation sites are dominated by *E. tetradonta* (Brennan *et al.* 2008; MET Serve 2014b), the tree species in which most Black-footed Tree-rat dens are located (Griffiths *et al.* 2002). The primary factor constraining the recolonisation of rehabilitation sites by Black-footed Tree-rats is likely to be the slow development of tree hollows in young trees. Tree hollows have yet to form in any rehabilitated sites, even after 40 years.

Despite the lack of hollows, rehabilitated sites are widely utilised by Black-footed Tree-rats. Cameras installed to inform the occupancy model detected tree-rats in rehabilitated sites of all ages older than five years. Occupancy of rehabilitated sites increased progressively over the first 30 years of vegetation development. Rehabilitated sites that were 21-30 years old were occupied by Black-footed Tree-rats to a similar extent to remnant vegetation (**Figure 4-3**). The detection of tree-rats in rehabilitated areas, 1.3-1.8 km from the nearest hollow tree, within an hour of dawn or dusk, suggested that Black-footed Tree-rats shelter within rehabilitated areas, rather than commuting from nearby remnant forests. Black-footed Tree-rats are known to utilise the dense foliage of *Pandanus spiralis* and *Carpentaria acuminata* as dens when hollows are not available (Rankmore 2006), and it is likely that dense tangles of plants such as *Alyxia spicata* provide shelter sites in rehabilitated areas at Gove.

One surprising finding from the occupancy model, and the survey associated with it, was that rehabilitated sites older than 30 years were mysteriously under-utilised by Black-footed Tree-rats. Partially, this may be explained by the location of older rehabilitated sites near the centre of the mine where there is heavy mining traffic and an abundance of roads and other infrastructure that fragments the habitat and amplifies edge effects. However, it is also possible that some other habitat feature important to tree-rat deteriorates in forests that have gone too long without fire. Further monitoring will help distinguish between these two hypotheses.

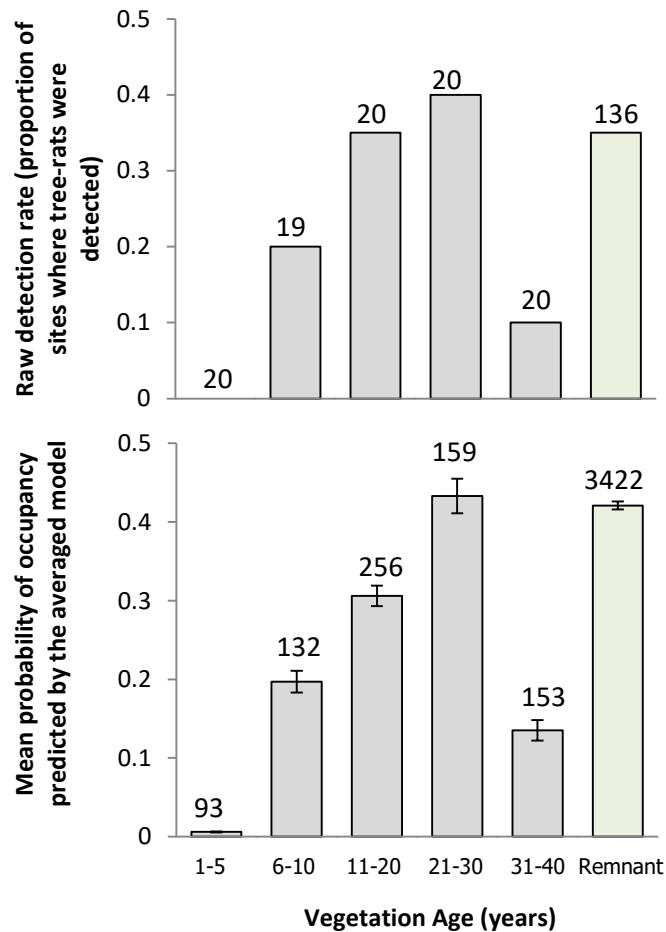


Figure 4-3 Recolonisation of rehabilitated areas at Gove by Black-footed Tree-rats. Sample sizes are listed for each group.

4.6 IMPORTANCE OF FIRE

Altered fire regimes have been implicated in the decline of many medium-sized mammals and granivorous birds across northern Australia (Woinarski *et al.* 2010; 2011). Availability of hollows for dens, and density of fruit-bearing shrubs are likely to be affected by burning frequency. The sensitivity of these important habitat features to fire and the decline of tree-rat populations in remote places with few other threatening processes means that too frequent or intense fires are frequently cited as leading causes of the national decline of the species (Threatened Species Scientific Committee 2015). Evidence for an important role of fire frequency is, however, very weak (refer to **Section 3.7**).

The findings from the occupancy model were equally unclear about the importance of fire regime for predicting tree-rat distribution. Four different fire-related covariates were added to models. Of these, the strongest support was for 'time since the last fire', which was positively related to occupancy by Black-footed Tree-rats. However, even this covariate had only a 33.5% likelihood of being included in the most significant models. Despite this weak evidence for fire being important predictor of occupancy by tree-rats, fire frequency was highly correlated with vegetation density, an environmental covariate with a very strong association with the presence of Black-footed Tree-rats. As a result of this correlation with vegetation density, areas that experienced a low frequency of fires had a higher mean probability of occupancy by Black-footed Tree-rats. This negative relationship was

especially pronounced when late fires were considered separately, such that regular late fires were detrimental to Black-footed Tree-rats. Frequency of early fires appeared to have less of an impact on tree-rat presence, consistent with the lower presumed intensity of such fires (Russell-Smith *et al.* 2003). Interestingly, the expected catastrophic consequences of late fires at sites with low fire frequencies, and presumably higher fuel loads, were not observed. In fact, infrequently burnt sites were more often utilised by Black-footed Tree-rats when occasional fires were late rather than early. It is possible that heavily overgrown, long-unburnt sites may benefit from occasional high-intensity fires that stimulate regeneration of some woody species.

In general, the fire regimes at Gove are relatively benign, compared with elsewhere in northern Australia. Most of the mining lease is inaccessible to the public, which is the source of most fires. Furthermore, the network of mined areas, mine roads and tracks act as fire breaks, which prevent the development of large-scale fires. Within the last 15 years, remnant eucalypt forests of the Gove mining lease experienced a mean time of 4.5 years between fires and a median time of 5 years between fires. Even the most regularly burnt areas only burned on average every second year. This is in stark contrast to the annual fires that burn through open forests across much of northern Australia (Russell-Smith *et al.* 2003). Gaps of five years between fires allow fleshy-fruited midstorey trees to grow to a height at which they escape future fires (Russell-Smith *et al.* 2003). This implies that the benefits of benign fire regimes persist for many years after regular fires are re-introduced.

Overall, despite the occupancy models providing weak support for the direct effect of fire regime on Black-footed Tree-rat distribution, there is compelling evidence to suggest that fire regime, acting indirectly through its effect on other important environmental covariates, has important ramifications for the conservation of the species. It is recommended that the Gove mine preserves current benign fire regimes. A frequency of one fire every seven to eight years is associated with vegetation densities optimal for habitation by tree-rats. Fires lit at such infrequent intervals are best carried out late in the dry season (after September). At sites where fire exclusion is not possible (e.g., publicly accessible areas), early fires lit every two to three years are preferable to late fires.

5 POTENTIAL IMPACTS

Impacts from mining and mine related activity vary during different phases of the operation. In addition, impacts can be caused by external factors totally unrelated to RT Gove Operations. To help clarify these relationships, potential impacts on the Black-footed Tree-rat have been collated and cross-tabulated in (Table 5-1) with the operational impacts split between the mining phases of construction, operations and closure. Further detail information on these impacts is covered in **Sections 5.1-5.9**.

Table 5-1 Potential impacts on the Black-footed

	Phase			
	Pre-Operational Drilling, Timber Clearing and Overburden Removal	Operations Bauxite Extraction and Haulage	Post Operational Rehabilitation and Land Management	External factors Recreational, TO land use and Tourism Activities
Activities/ Impact				
Removal of vegetation resulting in loss of habitat, food resources and protective cover	✓		✓	
Barriers to fauna movement and fragmentation of populations	✓	✓	✓	
Fauna mortality from vehicle/equipment strikes		✓		✓
Unintentional introduction of noxious weeds	✓	✓	✓	✓
Habitat damage and/or predation from introduced animals (dogs, cats, etc.)			✓	✓
Increase in damaging fires from poor fire management	✓	✓	✓	✓
Disruption to fauna from noise, vibration, dust and lighting	✓	✓		
New or unsuitable habitats introduced from mine rehabilitation.		✓	✓	
Increased putrescible waste		✓		✓
Extreme weather events (cyclones)				✓

5.1 LOSS OF HABITAT

Habitat features important to Black-footed Tree-rats include food plants, denning sites and protective cover while foraging. Loss of all or some of these features may reduce the overall population of tree-rats that inhabits the Gove mining lease. All three habitat features are removed during the pre-operational phase of mining, remain absent during the operational phase, and are gradually returned during the post-operational phase. The rates at which the three habitat requirements return vary. Protective cover is expected to return within five years, as grasses and acacias develop (Brennan *et al.* 2008). Food resources are expected to develop more slowly (5-20 years), as these are dependent on the maturation of midstorey trees and shrubs. Denning sites are expected to develop slowest. Tree hollows take over 50 years to develop, and even dense tangles of vegetation that can be used as den sites probably take over 20 years. Recolonisation of rehabilitated sites is closely tied to the development of these three habitat features. The occupancy model revealed that tree-rats start to utilise sites that are five years old, but it is not until sites are 20 years old that they are occupied to similar extent to uncleared remnant forest (MET Serve 2016a).

Inappropriate seed mixes and rehabilitation techniques may delay the development of necessary habitat requirements for the Black-footed Tree-rat.

Provided that rehabilitation sites ultimately develop the necessary habitat features for Black-footed Tree-rats, habitat loss incurred during the pre-operational phase of mining will not be a permanent impact. An exception is when excessive habitat is lost from core populations of the species; if remaining habitat is insufficient to support viable populations of the species in the meantime, localised extinctions may result and recolonisation of rehabilitation sites cannot occur. The preservation of appropriately sized refugial populations in unmined areas is paramount for avoiding such long-term impacts. This can be achieved by ensuring that the total amount of habitat removed in any ten-year period does not substantially reduce the total extent of habitat available.

Based on forecast changes to the modelled Black-footed Tree-rat population at Gove between 2015 and 2025 (see **Section 4.3.5**), creation of new habitat in rehabilitated sites will almost completely offset the loss of habitat through clearing. The tree-rat habitat currently contained within the Gove mining lease is predicted to decrease in extent by 0.34% (equivalent to approximately 22 ha of habitat).

It cannot be assumed that the negligible amount of habitat loss predicted over the next ten years will be representative of all future periods. The absence of detailed mining plans beyond 2030 precludes detailed modelling of impacts, although habitat losses are expected to be somewhat higher after 2030 than in the ten years prior. This is because areas likely to be cleared and mined after 2030 currently contain habitats with a very high probability of occupancy by tree-rats. Regular monitoring should investigate temporal fluctuations and inform new population forecasts when future mining plans are developed.

Under the EPBC Act, an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. For an Endangered species, such as the Black-footed Tree-rat, significant impacts are any that:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; and/or
- interfere with the recovery of the species.

Current mine plans indicate that no significant impacts to Black-footed Tree-rats are anticipated over the next ten years at Gove.

5.2 HABITAT FRAGMENTATION

All else being equal, highly fragmented habitats support fewer species than connected blocks of habitat of the same total size. This is because fragmentation restricts dispersal between available habitat. Smaller habitat fragments support smaller populations of wildlife, and small, isolated populations are more vulnerable to extinction through stochastic events. The impacts of habitat fragmentation depend on the degree to which dispersal is inhibited by habitat gaps, the size of the remaining habitat fragments, and ecological attributes of the species (home range size, population densities, dispersal mode, nomadic versus sedentary, etc).

The large home-ranges of Black-footed Tree-rats make them relatively sensitive to habitat fragmentation. Rankmore (2006) found that tree-rats were absent from fragments smaller than 2 ha, and were only found in fragments less than 25 ha when these had a high connectivity with neighbouring habitat. Low levels of fragmentation may benefit the species by inhibiting large-scale fires (Rankmore 2006). Black-footed Tree-rats have been observed to move up to 700 m across cleared areas to reach habitat fragments, and up to 1.2 km through 3-4 m high regrowth (Rankmore 2006). Based on the study by Rankmore (2006), cleared areas greater than 700 m wide are likely to constitute a barrier to movement, and fragments of suitable habitat less than 25 ha in extent that are isolated from other suitable habitat are unlikely to support Black-footed Tree-rats.

In general, habitat fragmentation is not likely to be an important impact of mining operations on the Gove Operations mining lease. Current habitats are largely contained within broad, continuous tracts of forest off and around the edges of the bauxite plateau. Furthermore, mining generally proceeds outwards from the centre of the bauxite plateau, such that no areas of habitat are isolated as a result from clearing.

Nevertheless, any future activities that fragment tree-rat habitats must be appropriately assessed and managed. Assessment of habitat fragmentation should be carried out every five years, based on updates to the 15-year mine plan.

5.3 INJURY OR MORTALITY FROM TREE-FELLING

Tree-felling and clearing occurs during the pre-operational phase of mining; a limited amount occurs prior to drilling and the remainder occurs 2-5 years prior to the commencement of extraction. Drilling involves the clearing of 5 m wide, parallel lanes, 50 m apart.

The diurnal resting behaviour of Black-footed Tree-rats in dens situated within the hollow branches of tall trees makes them particularly susceptible to direct injury or mortality during clearing. Risk of injury may be highest while breeding, but reproduction occurs throughout the year, and therefore there are not specific seasons when these impacts are expected to be greatest.

5.4 INJURY OR MORTALITY FROM VEHICULAR COLLISIONS

Vehicular traffic, especially during the operational phase of the mine, has the potential to increase the incidence of collisions with Black-footed Tree-rats. Risk of collision is highest in habitats where populations are most dense.

Traffic is influenced by the design of the mine road network. Mining proceeds outwards from the central mine compound area (to where mined material is transported), creating a radial network of haul roads. The density of haul roads, and therefore traffic, is highest near the centre of the mine, in habitats that primarily comprise formerly mined, rehabilitated areas. Core habitats for Black-footed Tree-rats along the plateau margins have the lowest traffic densities.

Any collisions between animals and mining vehicles are logged at Gove Mine, and considering the abundance of the species on-site, there are surprisingly few records of collisions taking place. Black-

footed Tree-rats are familiar to most truck-drivers on-site, indicating that they are regularly seen, but they appear to avoid being hit by haul trucks driving 70 kph (the maximum speed limit).

In contrast, Black-footed Tree-rats have been recorded as road kill along the public roads, Melville Bay Road and Central Arnhem Road, which pass through the mining lease. The higher speed limits (100 kph) along these roads are a likely reason for this. No research has explicitly examined the relationship between speed limit and road mortality of Black-footed Tree-rats, although it has an important relationship for other Australian fauna (Hobday 2010).

Any speed reductions that are deemed necessary are only relevant at night, as the species is inactive during the day.

5.5 WEEDS

The invasion of exotic weeds has not been listed among recognised threats to the Black-footed Tree-rat (Hill 2012). Furthermore, weed densities were not correlated with tree-rat abundance in Darwin (Rankmore 2006). However, high-density weeds can out-compete native species and lead to reduced floral diversity of forests (DSEWPAC 2013). The Black-footed Tree-rat's dependence on a diversity of seed, fruit and flower-producing plant species to provide a year-round food supply (Friend 1987; Morton 1992) may make the species vulnerable to weeds. Furthermore, the invasion of exotic grasses in northern Australia increases the prevalence and severity of fires (Rossiter 2007; Rossiter *et al.* 2003), which is thought to reduce habitat suitability for the Black-footed Tree-rat.

Weeds are introduced via the intentional and unintentional (on vehicles, shoes) movement of topsoil during all phases of mining operations. Weeds are most prevalent in the post-operational phase, and have the potential to inhibit the development of habitat for the Black-footed Tree-rat within rehabilitation sites. Weed densities don't tend to increase with the age of rehabilitation sites (Brennan *et al.* 2008; MET Serve 2014b), so early detection and control is desirable.

The weed species most prevalent in rehabilitation sites are *Emilia sonchifolia*, *Hyptis suaveolens*, *Melinis repens* and *Passiflora foetida* (all are present in more than half of rehabilitation sites: Brennan *et al.* 2008). None of these herbaceous species occur at densities that exacerbate fires or impair the germination and growth of tree-rat food plants (Brennan *et al.* 2008). However, a number of weeds that occur in low densities within the Gove Operations mining lease and in surrounding areas have the potential to have greater impacts on the Black-footed Tree-rat if allowed to spread. In particular, the aggressive exotic grasses *Cenchrus pedicellatus*, *Melinis minutiflora* and *Urochloa humidicola* have the potential to out-compete native understorey flora and increase fire intensity.

5.6 FERAL ANIMALS

Grazing by introduced cattle and buffalo has been implicated in the decline of the related Golden-backed Tree-rat (*Mesembriomys macrurus*), as it may reduce the understorey trees and shrubs that the animals rely on for food and open up the understorey making animals vulnerable to predation by Feral Cats (Palmer *et al.* 2003). The densities of Water Buffalo and Cattle on the Gove mining lease, while considerable, are unlikely sufficient to alter understorey structure. Feral Cats are ubiquitous on the Gove mining lease, and have been recorded at sites containing Black-footed Tree-rats. They were recorded at 14.4% of the cameras installed when surveying for Black-footed Tree-rats (MET Serve 2016a), and are likely to be much more widespread considering they have large home ranges and are notoriously difficult to detect (Stokeld *et al.* 2015). Any actions that increase the densities of cats (e.g., dumping of putrescible wastes, control of dingos) or reduce protective cover for tree-rats (vegetation clearing, intense late-season fires) may increase predation pressure on the Black-footed Tree-rat.

5.7 ALTERED FIRE REGIME

As discussed in **Section 4.6**, fire regime has unresolved but potentially important impacts on the suitability of habitats for Black-footed Tree-rats. Therefore, any alterations to the existing fire regime as a result of mining operations could affect the species. Such alterations may arise through the creation of new haul roads acting as fire breaks, creation of new ignition sources due to increased human traffic, or restriction of access by indigenous members of the public who deliberately start fires for cultural reasons.

Based on patterns over the past four decades of mining at Gove, the operations have had a net effect of reducing fire frequencies within the mining lease. This has probably benefitted Black-footed Tree-rats. Fire is planned to be introduced to some rehabilitated sites that have gone long-unburnt, although any intentional burns will be informed by best available data, with an explicit goal of optimising habitats for Black-footed Tree-rats and other species of conservation significance.

An Ecological Fire Management Guideline is currently in preparation for the Gove minesite. This will aim to enhance habitat features for threatened species known and expected to be onsite, via strategic prescription burns introduced through annual and long-term fire plans.

5.8 NOISE, DUST AND LIGHT

Noise, dust and light associated with vehicular movements and extraction of bauxite are primarily impacts of the operational phase of the mine, but occur to a lesser extent in the pre-operational phase.

Loud noises may startle animals and lead to higher stress levels and associated illness (Milligan *et al.* 1993; Baldwin *et al.* 2006; Baldwin 2007). It is unknown to what extent Black-footed Tree-rats are impacted by noise, but laboratory rodents display clear stress responses to prolonged exposure to sudden noises of 90-100 dB (Baldwin 2007). Black-footed Tree-rats are unlikely to be present within close proximity to mining operations, as such areas will have been cleared of habitat prior to extraction of bauxite. At a distance of 100 m or greater from mining operations, noise levels are not expected to reach those damaging to the health of rodents (**Table 5-2**).

Table 5-2 Summary of sound power levels for operational noise sources*

Source	Configuration when measured	Overall sound power level (dB)	Overall sound power level at 100 m (dB)
Rear Dump truck	40 km/h laden	131	83
Loader	normal work rate	118	70
Grader	20 km/h	112	64
Bulldozer	Mine rehabilitation area	120	72

*data from bauxite operations in Weipa (Rio Tinto Alcan 2013).

Dust is not expected to have a significant impact on Black-footed Tree-rats. There is a possibility that the growth of food plants situated close to mining operations or unsealed roads may be slightly impaired by dust deposition on leaves (Eller 1977; Thompson *et al.* 1984; Farmer 1993). However, these impacts are expected to be highly localised and minor.

The 24 hour working day at Gove Operations necessitates the use of flood lights and vehicle lights during the operational phase. The effect of artificial lighting on native wildlife has been poorly studied (Longcore & Rich 2004). Often, the impacts of artificial light can be very subtle. For many species, light is an important cue for regulating circadian rhythms, and artificial light may interrupt natural patterns of sleep and cell repair (Ben-Shlomo & Kyriacou 2010). This is particularly pronounced in birds (Miller 2006; Kempenaers *et al.* 2010), but may also be relevant to nocturnal mammals. Artificial light can also have important impacts on nocturnal predators and their prey. Several prey species reduce their activity in the presence of artificial light (Baker & Richardson 2006; Rotics *et al.* 2011;

Davies *et al.* 2012). Conversely, the densities of predators are higher in artificially lit environments (Davies *et al.* 2012). Artificial light may elevate the threat posed by Feral Cats on the Black-footed Tree-rat. The overall effect of artificial light on Black-footed Tree-rats is unknown. Lighting is not considered an important threat to the species elsewhere (Hill 2012). Considering that the operational areas (where artificial lighting is most used) have been cleared of habitat, it is unlikely that this lighting poses a significant threat to the species.

5.9 WASTE

Any putrescible waste that is left on-site (possibly during the pre-operational and operational phases of mining) has the potential to attract feral predators, and indirectly lead to impacts on the Black-footed Tree-rat. These impacts are expected to be minor and short-term on the Gove Operations mining lease.

6 RISK ASSESSMENT

In order to more fully understand the general risks to BFTR, RT Gove assessed the potential risk of the major impacts, both mining and non-mining impacts using the Rio Tinto risk assessment matrix (Figure 7).

Figure 7 - Rio Tinto Risk Assessment Matrix

Likelihood	Consequence				
	1 - Minor	2 - Medium	3 - Serious	4 - Major	5 - Catastrophic
A - Almost Certain	Moderate	High	Critical	Critical	Critical
B - Likely	Moderate	High	High	Critical	Critical
C - Possible	Low	Moderate	High	Critical	Critical
D - Unlikely	Low	Low	Moderate	High*	Critical
E - Rare	Low	Low	Moderate	High*	High*

Note: All risks that have a Critical risk classification from a qualitative analysis (using the risk determination matrix) must be re-evaluated using a Level 3 quantitative analysis.

* Consideration must be given to escalate all risks with a consequence of Major or Catastrophic and a classification of High to a Level 3 quantitative analysis.

Application of the Rio Tinto risk assessment matrix requires an evaluation of consequence and likelihood for each risk item using the methodology outlined below and the definitions described in Table 6.

6.1 APPLICATION OF RISK ASSESSMENT METHODOLOGY

6.1.1 Likelihood:

Determination of the 'likelihood' rating must consider the probability of the aspect having an impact (whether it be positive or negative) on the species or community as a whole, rather than the impact on a specific individual specimen or animal.

An assessment of 'likelihood' must also consider the likelihood of the feature occurring on the area where the threatening activity occurs. For example, although some species have been recorded in the area they have not been sighted for a long period of time (for example, the Northern Quoll and Golden Bandicoot have not been sighted for 15 years).

6.1.2 Consequence:

The 'consequence' definitions are detailed in Table 6. Level of endemism of a species or community must be considered when considering consequence. For example, if a species is endemic to the region and has a highly restricted range, the consequence of disturbance will be considerably higher than a species of wider distribution.

Table 6 – Likelihood and Consequence Assessment Table for Biodiversity Features

LIKELIHOOD				
A - Almost Certain	B - Likely	C – Possible	D – Unlikely	E – Rare
Impacts arising from RT activities				
Loss of species habitat &/or floral communities is inevitable due to existing and proposed activities at the business unit. Programmes cannot be established by the business that protect habitat &/or floral communities.	Loss of species habitat &/or floral communities is inevitable due to existing and proposed activities at the business unit. Whilst programmes to protect habitat &/or floral communities may be established by the business unit, it is likely that some loss will occur.	Some areas of species habitat / floral community likely to be disturbed through current and future clearance activities on business unit land and/or adjacent land owned by other landowners. Amendments to on-site activities &/or implementation of conservation programmes may lead to protection of species/community.	Management practices are in place that assists in the protection of the species habitat / floral community through active protection such as fencing.	Defined biodiversity management practices are in place to ensure the protection of the species habitat / floral community through active protection such as fencing, offsetting and revegetation.
Impacts independent of RT activities				
Loss of species habitat &/or floral communities is inevitable. Non-mining factors such as disease, predation, incompatible land use etc. are leading to irreversible species loss in the area.	In the absence of external intervention, loss of species habitat &/or floral communities is inevitable. External factors such as disease, predation, incompatible land use etc. are leading to irreversible species loss in the area. Whilst programmes to protect habitat &/or floral communities may be established, it is likely that some loss will occur.	Chronic, long-term degradation of species habitat / floral communities may be possible through incompatible land use &/or other influencing factors (salinity, soil degradation, run-off, noxious species, climate change etc.) Implementation of conservation programmes may lead to protection of species/community.	Species habitat / flora communities are unlikely to be affected by current and proposed land uses. Management practices are in place to assist the protection of the species habitat / floral community where known impacts are occurring.	Species habitat / flora communities not affected by current and proposed land uses. Defined biodiversity management practices are in place to ensure the protection of the species habitat / floral community to mitigate any potential impacts.
CONSEQUENCE				
1 – Minor	2 – Medium	3 – Serious	4 – Major	5 - Catastrophic
Only local and limited impacts to flora and fauna anticipated. No changes to regional populations / coverage expected.	Some local and possible regional impacts to flora and fauna, but limited changes to regional populations. Regional recovery possible through appropriate measures.	Local extinction and/or substantial regional loss of species/communities. Local and regional recovery may be possible through dedicated offset / revegetation / captive breeding / relocation programmes.	Regional extinction and/or substantial loss of majority of known population. Potential outright extinction (total loss) of species/community on a global scale, and species recovery most likely irreversible.	Likely outright extinction (total loss) of species/community on a global scale, and species recovery irreversible (e.g. revegetation or captive breeding/relocation programmes etc.)

6.1.3 Current and Predicted Risk

The risk assessment for BFTR considered both the risk with current controls in place (current risk) and the risk after additional controls are implemented (predicted risk). The intent of this exercise is to review risk under prevailing conditions, recognising any controls that are in place to preserve the biodiversity feature, and to determine steps that could be taken (future biodiversity actions) to reduce the risk to more acceptable levels.

The outcome of the risk assessment and the additional controls proposed are summarised in **Table 6-1**.

Table 6-1 Risk in place to reduce impacts of Rio Tinto Gove Operations on Black-footed Tree-rats

Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Additional Controls / actions	Consequence	Likelihood	Risk Rating	Comments / Rationale
Removal of vegetation and loss of habitat features	Clearing outside of permitted areas	Pre-clearing flora/fauna surveys Vegetation Clearing Approval Procedure GPM-EHS-014 Excavation Permit System GPM-ENG-83-0-14	3-Serious	C-Possible	High	SSMP protocol assessment to be used for Timber and Drill Lane clearing activities as part of Vegetation Clearing Permit assessments. Mine Induction to include a section on BFTR (three year validity). Camera surveys and occupancy models are to be repeated every five years, forecasting patterns over the following ten years.	2-Medium	D-Unlikely	Low	Refer to Section 5.1 of SSMP

Significant Species Management Plan Black-footed Tree-rat

Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Additional Controls / actions	Consequence	Likelihood	Risk Rating	Comments / Rationale
Increase in damaging fires in BFTR habitats	Poor fire management practices	Fire breaks program for the Mine Operations. 776 Water Tanker - Fire Control in Mine Rehabilitation Areas. Emergency Response teams grass fire attack units.	3-Serious	C-Possible	High	Development of Ecological Fire Management Guideline for native and rehabilitation areas within the mining lease. Controlled burning procedure at the mine to be developed.	2-Medium	D-Unlikely	Low	Refer to Section 5.7 of SSMP
Barriers to fauna movement and fragmentation of populations	Poor mine forward planning.	APM-MIN-028 Land Disturbance Procedure - pre-mining. APM-MIN-007 Mine Forward Development Plan	2-Medium	C-Possible	Moderate	Mine forward planning to included Occupancy model data and be reviewed	2-Medium	D-Unlikely	Low	Refer to Section 5.2 of SSMP
Habitat damage and/or native wildlife predation from introduced animals (pigs, dogs, cats, cane toads, etc.)	Poor waste management practices.	Gove Waste Management Procedure GPM-EHS-030. General Site Induction Mine Compound/Workshop Induction Dedicated waste receptacles Mine Compound/Rocky Bay.	2-Medium	C-Possible	Moderate	A Fire Management Plan should be developed to ensure that less than 40% of the mining lease is burnt in any one year, to maintain protective cover for tree-rats and reduce predation pressure by feral cats.	1-Minor	C-Possible	Low	Refer to Section 5.9 of SSMP

Significant Species Management Plan Black-footed Tree-rat

Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Additional Controls / actions	Consequence	Likelihood	Risk Rating	Comments / Rationale
Disruption to BFTR from noise, vibration, dust and lighting	Mining activities in close proximity to high BFTR habitat.	Water cart used for dust suppression of haul roads during dry conditions	1-Minor	D-Unlikely	Low	No further control measures are deemed necessary.	1-Minor	D-Unlikely	Low	Refer to Section 5.8 of SSMP
New habitats introduced from mine rehabilitation	Change to mine rehabilitation practices	Mine Rehabilitation Manual. Annual Rehabilitation Monitoring. Long Term Monitoring Rehabilitation Completion Criteria TO Agreement and lease conditions	2-Medium	D-Unlikely	Low	No further control measures are deemed necessary.	2-Medium	D-Unlikely	Low	Refer to Section 5.1 of SSMP
HME impact injury/mortality on BFTR	Timber clearing activities in high BFTR areas	Management of Injured Fauna and Fauna Affected by Operations GMP-EHS-119.Incident Management GPM-EHS-020.General InductionMine Compound/Workshop Induction.	2-Medium	D-Unlikely	Low	No further control measures are deemed necessary.	2-Medium	D-Unlikely	Low	Refer to Section 5.3 of SSMP

Significant Species Management Plan Black-footed Tree-rat

Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Additional Controls / actions	Consequence	Likelihood	Risk Rating	Comments / Rationale
Unintentional introduction of noxious weeds on machinery.	Poor Equipment Hygiene	Annual Weed Management Plan (monitoring and control) Equipment Inspection Mine Workshop FRM-MMW-009 Vehicles and Driving GPM-EHS-027	2-Medium	D-Unlikely	Low	No further control measures are deemed necessary.	2-Medium	C-Possible	Low	Refer to Section 5.5 of SSMP
Vehicle/HME impact injury on BFTR	Haulage and transport activities in proximity of high BFTR areas	Management of Injured Fauna and Fauna Affected by Operations GMP-EHS-119. Incident Management GPM-EHS-020. General Induction Mine Compound/Workshop Induction.	1-Minor	C-Possible	Low	No further control measures are deemed necessary.	1-Minor	C-Possible	Low	Refer to Section 5.4 of SSMP

6.2 TRAINING AND AWARENESS

Training relating to the Black-footed Tree-rat will be provided by suitably qualified individuals nominated by, and including, the Rehabilitation Specialist. Different levels of training will be required depending on the level of involvement in potential impacts to the species, and what responsibilities may be required of the individual.

6.2.1 Operators and Contractors

Operators and contractors are on-ground staff engaged in day-to-day operation of machinery within habitat for Black-footed Tree-rats. The following basic training is to be provided to all operational staff prior to each staff member's commencement:

- Visual identification of the Black-footed Tree-rat;
- Basic identification of suitable-sized trees and tree-hollows;
- Safe operation of on-road vehicles in areas known to support the Black-footed Tree-rat (awareness of speed limit restrictions); and
- Incident and emergency response (see **Section 6.1.4**).

6.2.2 Senior and Supervisory Staff

- As per training for operators and contractors.

6.2.3 Environmental Staff

In addition to the training provided for on-ground operational staff (above), specialist environmental staff (inclusive of both company and contract staff) will be trained in the following:

- Remote-sensory camera installment and use; and
- Identification of local woody plant species for the purposes of seed-collection and rehabilitation.

6.2.4 Incident and Emergency Response

The Rehabilitation Specialist and/or or Mine Supervisor will be contacted in the event of an incident (e.g., deaths, near misses, injuries, sightings, etc.) regarding a Black-footed Tree-rat. All incidents are to be reported on the Rio Tinto Business Solution and an Injured Fauna Form (**FRM-EHS-394**) is to be completed by the involved person(s) where an animal has been injured.

If a Black-footed Tree-rat is injured on the mine site and where it is safe for staff and the animal, the animal will be bundled in a dry warm blanket or jacket, placed in a closed container (e.g., an esky or plastic tub with a lid) and taken to a vet or approved wildlife carer. Serious injury to humans from the bites of Black-footed Tree-rats may result from inappropriate handling of injured animals. Live animals must not be handled without gloves or other thick material (e.g., blanket/towel) over the hands. Transporting an injured animal that is not contained is a safety risk due to the potential for the animal to regain mobility whilst in a moving vehicle, thereby distracting the driver. If it is unsafe or not possible to collect and transport the injured animal:

- the location of the injured animal is to be identified/marked so it can be found again. If the animal is moving, a note will be made of the direction in which it was headed;
- the type of injury sustained will be identified if possible (without handling or causing the animal further stress);
- the Rehabilitation Specialist (or nominated person on site) will be contacted immediately to capture or organise the possible capture of the animal for transportation to a specialist veterinarian or wildlife carer.

The Rehabilitation Specialist (or nominated person on site) shall immediately contact the organisation listed in **Table 6-2** and provide details of the last known location of the injured animal.

Table 6-2 Contact details in the event of an injury to a Black-footed Tree-rat

Organisation	Contact details
Gove Veterinarian Services	Phone: (08) 8987 1101 Address: 16 Traeger Close, Nhulunbuy.

Following the capture/recovery of the animal, an investigation into the cause of the event will be undertaken by the Environmental Superintendent including an assessment of the effectiveness of corrective and preventative actions currently in place.

Any corrective and preventative actions identified will be implemented. The risk register, relevant procedures and documentation (including this SSMP) will be reviewed and revised as is necessary.

In the event that a control measure is ineffective, the measure will be adjusted accordingly. This SSMP will be updated to reflect any significant changes to control measures.

7 MONITORING

Rio Tinto Gove Operations is committed to implementing monitoring programs specific to its operations, in order to characterise and track changes to the local Black-footed Tree-rat population, and examine the success of mitigation measures employed to reduce impacts to the species.

There are five principal monitoring programs that will operate concurrently:

- 1) Assessment of burn scars, annually;
- 2) Assessment of 18-month-old rehabilitation, annually;
- 3) Long-term flora monitoring of rehabilitation, every five years;
- 4) Camera surveys and occupancy models, every five years; and
- 5) Incident reporting, ongoing.

Together, these will monitor temporal changes in the size and distribution of the population of Black-footed Tree-rats within the Gove mining lease, as well as the performance indicators for mitigation measures listed in **Section 6**.

7.1 ASSESSMENT OF BURN SCARS

7.1.1 Objectives

The extent of fires in any one calendar year is important to monitor in order to establish the success of the Fire Management Plan. There are three goals listed in **Section 6** that specifically relate to fire patterns:

- less than 40% of the mining lease is to burn in any one calendar year;
- at least 75% of potential Black-footed Tree-rat habitat within the mining lease should burn every 4-8 years; and
- 10-20% of rehabilitated sites should never burn prior to the formation of hollows.

The objective of the assessment of burn scars is to monitor the attainment of these goals.

7.1.2 Timing

Assessment of burn scars is to be undertaken annually between the months of January and April, when there is an absence of fire due to the wet season.

7.1.3 Personnel

Assessment of burn scars may be undertaken by mine personnel or contractors with the necessary skills in geographic information system (GIS) software. It is the responsibility of the Rehabilitation Specialist to manage these works and file the resulting reports.

7.1.4 Methodology

Fire scar data for each calendar year should be downloaded from the North Australia and Rangelands Fire Information website (<http://www.firenorth.org.au/nafi3/>) as a Shape file. This should be opened using GIS software such as MapInfo or ArcGIS, and overlaid with the following data:

- mining lease boundary;
- shapes of rehabilitated areas; and
- shape of the extent of potential Black-footed Tree-rat habitat present within the year (the mining lease excluding mangroves, monsoon vine forest, sand dunes, *Melaleuca* swamps, cleared areas and rehabilitated areas less than 5 years old).

By employing tools in the GIS software, the following variables should be calculated:

- the percentage of the mining lease that burnt within the calendar year;
- the time since the last fire in each of the 250 m x 250 m fire scar cells contained within the mining lease; and

- the percentage of rehabilitated sites that have not experienced a fire since records began in 2000.

The above data is used to assess the attainment of the three goals listed in **Section 7.1.1**.

7.2 ASSESSMENT OF 18-MONTH-OLD REHABILITATION

7.2.1 Objectives

The primary objective of assessing 18-month-old rehabilitation is to provide an early indication of the success of seedling establishment in newly rehabilitated sites. One of the performance indicators for mitigating against loss of habitat for Black-footed Tree-rats is that the tree species most important as a source of dens, *Eucalyptus tetradonta*, should occur at stem densities exceeding 75 stems/ha in young rehabilitated sites. This is to be first assessed when these sites are 18 months old.

7.2.2 Timing

Surveys are to take place annually in July-August in rehabilitated sites established two wet seasons prior. The reason these surveys are to be undertaken in the dry season is that seedlings are more detectable against a background of dead grass than live, green grass.

7.2.3 Personnel

Surveys are to be undertaken by qualified ecologists competent in the identification of local trees and shrubs while these are in their seedling stage. It is the responsibility of the Rehabilitation Specialist to manage these works and file the resulting reports.

7.2.4 Methodology

A full description of the methodology to be adopted during 18-month-old assessments is contained within the *Annual Mine Rehabilitation Assessment Guideline*. In order to estimate stem densities of *E. tetradonta*, a 100 m x 5 m belt transect is to be randomly positioned within the rehabilitated blocks to be surveyed. Every seedling of woody trees and shrubs contained within the transect is to be counted and the tallies multiplied by 20 to generate an estimate of density per hectare. Transects should be positioned at least 50 m from roads. Small blocks of rehabilitation (< 2 ha) should have one transect, medium blocks (2-8 ha) should have two transects and large blocks (>8 ha) should have three transects.

Based on the above methodology, transects with more than four established seedlings of *E. tetradonta* are expected to develop into forests dominated or co-dominated by *E. tetradonta*.

7.3 LONG-TERM FLORA MONITORING OF REHABILITATION

7.3.1 Objectives

The primary goal of long-term flora monitoring is to examine whether rehabilitated sites are progressing towards targets specified in Rio Tinto Gove Operation's *Mine Closure Rehabilitation Completion Criteria*. These floristic surveys serve to characterise the species composition and structure of rehabilitation sites, and compare these to analogue sites in unmined forests. A number of floristic attributes relevant to the Black-footed Tree-rat are assessed in these surveys, including the following performance indicators listed in **Section 6**:

- *Eucalyptus tetradonta* should occur at stem densities exceeding 75 stems per hectare;
- sites older than 10 years should be dominated by *E. tetradonta*, based on basal area of woody vegetation;
- species richness of the woody vegetation (individual trees and shrubs >2 m height within a 100 m x 10 m belt transect) is to exceed the 10th percentile among analogue sites;
- no Class A weeds under the *Weed Management Act* are to be present;

- Class B weeds under the *Weed Management Act* should constitute less than 10% of the understorey vegetation cover and be stable or declining when measured over a five-year period; and
- the canopy of *E. tetradonta* and *Eucalyptus miniata* should remain intact following the first fire experienced by the rehabilitated site.

7.3.2 Timing

Long-term flora monitoring is to take place in the late wet season (March-May) every five years, coincident with the highest diversity of flowering and fruiting plant species. The most recent survey was undertaken in 2014.

7.3.3 Personnel

Surveys are to be undertaken by qualified ecologists/botanists competent in the identification of local flora. It is the responsibility of the Rehabilitation Specialist to manage these works and file the resulting reports.

7.3.4 Methodology

100 m x 10 m belt transects are surveyed at permanent monitor points in rehabilitated sites of varying age. Three sites are surveyed per age class. The current monitoring sites are listed in **Table 7-1**, but additional two-year old sites are to be added every five years.

Table 7-1 Permanent monitoring sites for long-term rehabilitation monitoring

Site name	Age in 2014 (years)	Latitude	Longitude
LT12A	2	-12.2951	136.8142
LT12B	2	-12.3030	136.8557
LT12C	2	-12.2861	136.8145
LT09A	5	-12.3056	136.8719
LT09B	5	-12.2943	136.8185
LT09C	5	-12.3021	136.8179
LT05A	9	-12.2909	136.8218
LT05B	9	-12.3255	136.9217
LT05C	9	-12.3239	136.9269
LT02A	12	-12.2987	136.8747
LT02B	12	-12.3280	136.9252
LT02C	12	-12.3047	136.8260
LT99A	15	-12.2859	136.8296
LT99B	15	-12.3313	136.9186
LT99C	15	-12.2937	136.8762
LT95A	19	-12.2883	136.8732
LT95B	19	-12.2895	136.8691
LT95C	19	-12.2947	136.8300
LT83A	31	-12.2851	136.8658
LT83B	31	-12.2900	136.8444
LT83C	31	-12.2825	136.8650
LT74A	39	-12.2851	136.8490
LT74B	40	-12.2702	136.8441
LT75A	40	-12.2671	136.8437

The following habitat attributes relevant to Black-footed Tree-rats are assessed during long-term flora monitoring:

1) Dominant Tree Species

The dominant tree species is assessed by determining which species constitutes the majority of the biomass within a 10 m x 100 m band transect. The diameter at breast height and species of all woody trees and shrubs taller than 2 m that occur within the belt transect are measured and recorded. The diameters are used to calculate basal areas for each trunk and these areas are summed for each species to calculate a total area per 1,000 m². The species with the largest basal area is considered to be the dominant one.

2) Stem densities

Rehabilitated sites younger than 10 years are going through transition from dominance by *Acacia* spp. to dominance by *Eucalyptus* spp. Stem densities of eucalypts can be used to indicate whether this transition is likely to occur (stem densities remain relatively stable over time). The number of stems of each species within the 100 m x 10 m belt transect is recorded concurrently with measuring stem diameters. All living stems taller than 2 m are counted. If the main trunk branches below breast height (1.3 m), it is counted as two stems. The number of *E. tetradonta* stems within the belt transect is multiplied by 10 to give density per hectare.

3) Woody Species Richness

Tree-rats feed on a broad range of large-seeded trees and shrubs, and favourable habitat should contain a high density and diversity of such food plants. Species richness can be calculated from the stem counts, and is defined as the number of different woody species (>2 m) recorded within the 10 m x 100 m band transect.

4) Canopy Cover

The percentage cover of woody vegetation (>2 m in height) is the vertical projection of the canopy and midstorey. This is assessed by calculating the proportion of the 100 m long measuring tape that lies beneath a woody plant. By tracking sites over time, changes in canopy cover following the first fire at a site can be measured.

5) Weeds

Weed density is assessed by estimating the percentage cover of each weed species within a series of 1 m x 1 m quadrats located along the 100 m measuring tape. Within each quadrat, the percentage cover (to the nearest 1%) of each native and weed plant species <1 m in height is to be estimated. Additional quadrats are to be assessed until no new plant species has been detected in two consecutive quadrats. A minimum of 10 and a maximum of 15 quadrats are to be assessed per transect. Weed density is calculated as a percentage of the total understorey plant cover.

7.4 CAMERA SURVEYS AND OCCUPANCY MODELS

7.4.1 Objectives

Occupancy models based on large-scale camera surveys are the principal monitoring tool to be applied at Gove Operations. This is to be the primary tool for:

- forecasting the loss of habitat;
- assessing potential impacts of habitat fragmentation;
- tracking temporal fluctuations in Black-footed Tree-rat distribution; and
- investigating the response of tree-rats to mitigation measures, such as imposed fire regimes.

7.4.2 Timing

Large-scale camera surveys are to be undertaken every five years. Surveys are to be undertaken in the early dry season (May-July). Cameras installed earlier in the year, when the nights are warmer, risk

being less able to detect the thermal signature of Black-footed Tree-rats. Cameras installed later in the year, when the likelihood of uncontrolled burns is higher, risk being damaged by fire.

7.4.3 Personnel

Surveys and occupancy models are to be conducted by qualified ecologists with experience applying occupancy models to remote-sensory camera data. Ecologists must possess the necessary Northern Territory Government permits and ethical approval for using baited cameras. It is the responsibility of the Rehabilitation Specialist to manage these works and file the resulting reports.

7.4.4 Methodology

The methodology to be adopted should follow that used for producing the occupancy model in 2015-2016 (MET Serve 2016a). This is summarised here, but for further information refer to the report cited.

The entire Gove mining lease is divided into 200 m x 200 m grid cells. Cells containing one of the following features are assumed to be vacant and are excluded from assessment: mangroves, beaches, coastal sand dunes, monsoon vine forest, wetlands and areas cleared for mining or infrastructure. Of the remaining cells (in 2015 there were 4,215), 240 are to be sampled using remote-sensory cameras. Selection of cells could either correspond to those sampled in 2015, or alternatively a different random set could be selected. In the case of the latter, selection of cells should be based on a stratified random design, ensuring an even spread of sites across the major habitat types (**Table 7-2**). Beyond 2025, there will be an additional age category to assess (51-60 years), requiring an increase to 260 samples. However, there may be limited remnant habitats remaining on the plateau at this time, so the sampling of this habitat could be reduced such that total sampling effort across all habitats remains constant over time. Where sampling is to be spread over several months, to allow reuse of cameras, sampling is to be stratified to allow a similar mix of habitats to be assessed during each sampling period.

Table 7-2 Sampling stratification across habitats

Location	Age	N camera sites
Off plateau	Remnant	70
On plateau	Remnant	70
	6-10 years	20
	11-20 years	20
	21-30 years	20
	31-40 years	20
	41-50 years	20

A Reconyx HyperFire HC550 White Flash camera (or similar model) is to be attached to the nearest tree to the midpoint of each sampling cell. Cameras should be set up to take three consecutive photos, one second apart, per trigger, with a 15-second delay after each three-photo batch before the camera can be triggered again. Cameras are to be positioned on the trunks of trees, 70 cm from the ground. Only trees with a diameter greater than 10 cm should be used to prevent false triggers from excessive swaying. At sites without trees, star pickets can be used. A bait station should be positioned 1.5 m in front of the camera. Each bait station is to comprise a 100 mm length of PVC pipe, with a waterproof cap and a vented base. Bait, consisting of a 3 cm diameter ball of peanut butter and oats, is placed in each pipe. The bait station is to be attached to a fence dropper, which is hammered into the ground. The entire area between the camera and bait station, including around the tree supporting the camera should be cleared of mulch and vegetation, to limit false triggers and risk of damage by fires.

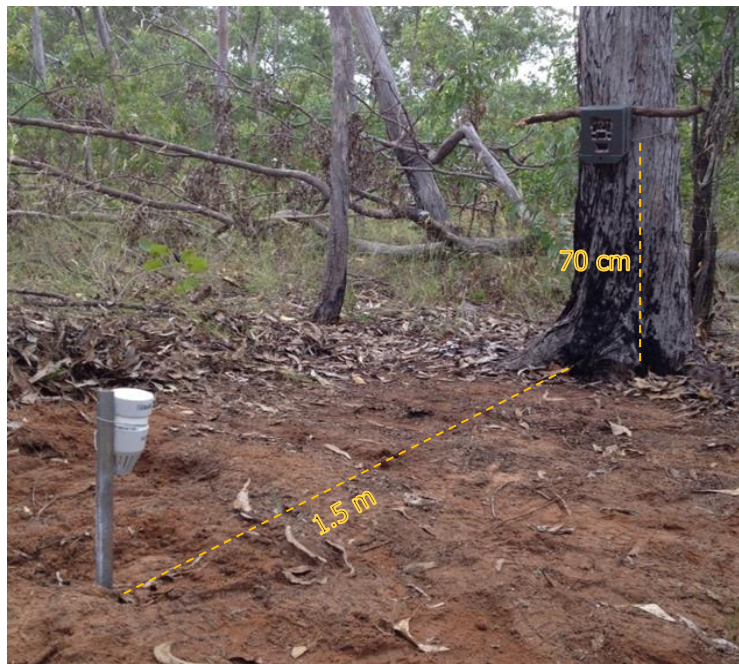


Figure 7-1 Standard camera installation for occupancy model surveys

After installing each camera, it is to be triggered by moving in front of it. The card is then to be removed and placed in a portable digital camera to check the field of view of the remote-sensory camera. The bait station should be in the centre of view. Further adjustments to the remote-sensory camera are required until the field of view is appropriate. After re-inserting the camera card and activating the remote-sensory camera, stand in front of the camera one last time to trigger it. This serves as a record of the start time and date of the camera, as well as a verification that the camera was operating properly at the start of the sampling period. Cameras are to remain operational for at least 28 nights. Cameras should be triggered by walking through their field of view immediately prior to collecting them on the 28th day. This serves as verification that the camera was operating properly at the end of the sampling period. Cameras that did not take start and/or end photos are to be dismissed as faulty, unless there is ample evidence that they were operating properly throughout the duration of the sampling period (i.e., there were photos taken at least every few days throughout the sampling period).

Occupancy modelling, which requires repeated sampling of each site, offers a very useful analytical framework for analysing data collected from motion-activated cameras. This is because each camera can gather repeated samples (each day or week can be treated as a single sampling occasion) without the need for additional investment in labour and resources. For the tree-rat occupancy models, each four-night period is to be treated as a sampling occasion, with seven occasions per camera. The data from each camera is to be stored as a detection history comprising a seven-digit long string of 1s and 0s. A 1 represents confirmed Black-footed Tree-rat presence and a 0 represents an absence of detection during that 4-night period. For example, a camera that recorded Black-footed Tree-rats in the second and third sampling occasion but not in any others would have a detection history of 0110000.

Occupancy models relate the detection data for each site to environmental data in order to make predictions about the relative effect of different environmental attributes on the probability of occupancy and detection. The minimum environmental data to consider for future occupancy models should include attributes assessed in 2015 (**Table 7-3**).

Table 7-3 Spatial data to use to generate the environmental covariate datasets

Variable	Data source	Description
Vegetation density	Landsat 8 Satellite Imagery	Landsat imagery should be taken on a single day within the sampling period. A date should be chosen that has limited cloud cover. Imagery is to be used to derive a 30 m x 30 m resolution Normalised Difference Vegetation Index (NDVI) grid across the mining lease. The average for each 200 m x 200 m cell is then derived from these finer scale estimates. Only vegetated areas are to be included within this larger estimate (i.e., excludes 30 m x 30 m sub-cells that represent cleared vegetation – see below).
Percentage cleared	Landsat 8 Satellite Imagery	Cells that are mostly cleared (haul roads, soil stockpiles, mine areas) are not to be included in sampling (see Section 7.4). However, among cells that are mostly vegetated, there is variation in the extent to which parts of the cell are cleared. Generally, NDVI values <0.3 represent cleared areas. The percentage of the 200 m x 200 m cell that comprises 30 m x 30 m subcells with an NDVI <0.3 is used to define the percentage of each sampling cell that is cleared.
Soil	ASRIS Level 4 Australian Soil Classification from the Australian Collaborative Land Evaluation Program ACLEP, endorsed through the National Committee on Soil and Terrain.	There are five soil classes mapped as occurring within the Gove mining lease: (1) Tenosols, (2) Kandosols, (3) Rudosols, (4) Hydrosols and (5) Anthroposols. The Anthroposols are an erroneous classification; ephemeral wetlands are misidentified as cleared pasture. Hydrosols are confined to areas that do not constitute tree-rat habitat (mangroves, wetlands). The remaining three soil classes are to be incorporated into models. Cells straddling multiple soil classes are to be assigned the class that intersects the cell centroid.
Fire	North Australia Fire Information (NAFI)	The following data are to be generated for each sampling cell: (1) time since last fire, (2) frequency of fires over the previous 15 years, (3) frequency of early fires (Jan-Sep) over the previous 15 years, and (4) frequency of late fires (Oct-Dec) over the previous 15 years. Cells with multiple fire regimes are assigned the regime that intersects the cell centroid.
Plateau boundary	Rio Tinto Gove Operations	This dataset depicts the extent of the plateau contained within the Gove mining lease and generally represents the extent of the bauxite deposit that is the subject of the mining operation.
Vegetation Age	Rio Tinto Gove Operations	All mined areas that are rehabilitated are mapped and labelled by year of establishment. These are classified into six categories, in addition to remnant vegetation: (1) 1-5 years old, (2) 6-10 years old, (3) 11-20 years old, (4) 21-30 years old, (5) 31-40 years old and (6) 41-50 years old. The 1-5 years old category is excluded from sampling, as past surveys have revealed these to be vacant. Cells containing vegetation of multiple ages are assigned the age that intersects the cell centroid.
Proximity to water	Rio Tinto Gove Operations; MET Serve field observations	Rio Tinto Gove Operations has surveyed the locations of all waterways within their mining lease. The ephemeral upper reaches of waterways are excluded, and the locations of the boundaries between ephemeral and (semi-) permanent creeks are based on field observations. A 1 km buffer is to be placed around these permanent waterways and any sampling cells with a centroid that fell inside this buffer were assigned to the 'within 1 km of water' class. A distance of 1 km was chosen as it represented the maximum possible distance a Black-footed Tree-rat could travel in a single night.

The environmental and detection data for each sampling cell are to be analysed using the program PRESENCE. This software is developed by James Hines at the Patuxent Wildlife Research Center, USA, and is available for free download. This software estimates the proportion of the area occupied or the probability that a single site is occupied, taking into account imperfect detection. Simple, single-season models are to be fitted to the data. All continuous environmental covariates are to be standardised ((value – mean)/standard deviation) prior to importing the data into the program. The means and standard deviations should be based on the entire mining lease, not only the 240 sampling cells.

In order to assess the relative importance of the different environmental covariates for predicting occupancy by Black-footed Tree-rats, various combinations of covariates are included in different models, and the best model(s) are determined by their Akaike Information Criterion (AIC) score.

Goodness of fit should be assessed using the “assess model fit” function for the global model (the model containing all environmental covariates). Use 10,000 parametric bootstraps to calculate an overdispersion parameter ($\hat{c}$). A $\hat{c}$ greater than 1 can indicate model inadequacies, lack of independence of data points, heterogeneity in parameters (there may have been unmeasured covariates related to model fit), or a combination of these. If the $\hat{c}$ value is significantly greater than the null of 1, but this difference is relatively minor (i.e., the $\hat{c}$ value is less than 3), $\hat{c}$ can be accounted for during model selection to allow for a more conservative inference. This is achieved by computing the quasi-AIC (QAIC) for a model with k parameters using the formula, $QAIC = -2\log(\text{likelihood})/\hat{c} + 2K$. QAIC is then used instead of AIC for the model selection process, and standard errors are inflated by a factor of $\sqrt{\hat{c}}$.

In general, there is rarely one clear best model, with multiple candidate models having similar AIC (or QAIC) scores. This implies that many of these are reasonable hypotheses to explain the data. Instead of drawing inferences from the single best model, model-averaged estimates of occupancy (ψ) and detectability (p) are to be calculated as per MacKenzie *et al.* (2006).

Models that explain a large proportion of variance in data may have a good ‘fit’ yet poor predictive power if the significant covariates explaining the variation are spurious. It is important to test the measures of prediction success using independent data that were not used to develop the prediction model. One approach that has been widely used to achieve this is data partitioning, whereby data are randomly split into a ‘training’ set and a ‘testing’ set (Fielding and Bell 1997). When there are more than 10 covariates included in models, it is generally recommended that the training set comprises 75% of the cases (Huberty 1994; Fielding and Bell 1997). The 240 camera sites should be stratified by age and plateau position, and every fourth site is removed from the training dataset and used to test the predictive power of the resulting models. A receiver operating characteristic (ROC) plot is then to be used to calculate how well the averaged model based on the training dataset predicts the detection patterns observed in the testing dataset. ROC plots are created by plotting the true positive fraction (proportion of actual positives that were predicted to be positive) on the y-axis against their equivalent false positive fraction (proportion of actual negatives that were predicted to be positive) for all available thresholds on the x-axis. A straight line with a slope of 0.5 is predicted by chance; both the rates of true positives and false positives increase equally when cells have increasing values of ψ . In predictive models, however, the fraction of true positives will increase faster than the fraction of false positives, and the area under the plot (between 0.5 and 1) provides an estimate of the predictive power of the model. These plots are carried out using packages available in R or similar software.

There are four main pieces of information that are to be acquired using the occupancy models:

- 1) Proportion of the mining lease that is occupied: this is calculated by summing the model-averaged estimates of ψ for each sampling cell and then dividing by 5,060, the total number of cells in the entire mining lease (including vacant cells of non-habitat). This is used to track relative changes in occupancy over time.
- 2) Map of current distribution: the model-averaged estimates of ψ are to be used to colour-code each cell within the mining lease in order to produce a ‘heat map’ showing the areas with the greatest probability of occupancy. This heat map can be used to determine whether the population is continuous or likely to be fragmented by gaps of unsuitable habitat.

- 3) Predicted changes to the occupation of the mining lease over the next ten years: the 15-year mine plan should be used to forecast the environmental values that are likely to occur in each cell within the mining lease ten years in the future. The models can be re-run based on the forecast environmental values to predict what proportion of the mining lease will be occupied in the future. The relative change in occupancy over the ten years is used to assess significance of impacts.
- 4) Relevance of environmental variables: by repeating occupancy models every five years, one can generate robust data about the importance of different environmental variables to Black-footed Tree-rats. This will serve to clarify the roles of currently ambiguous factors, such as fire regime and the development of rehabilitated areas, which will inform management practices on the mining lease.

7.5 INCIDENT REPORTING

7.5.1 Objectives

The goal of incident reporting is to record the frequency of direct deaths, injuries and near misses of Black-footed Tree-rats and other wildlife that arise from the mining operations. This may be used to identify key fauna crossing sites along haul roads, and to establish whether further mitigation measures are warranted.

7.5.2 Timing

Incident reporting is to occur throughout the life of the mine — in pre-operational, operational and post-operational phases.

7.5.3 Personnel

All personnel that witness an incident, or find a dead or injured animal resulting from an incident, are responsible for reporting the incident.

7.5.4 Methodology

For each incident, the date, time, location, reporter's name and a description of the incident is to be recorded and lodged with the Rehabilitation Specialist. The Rehabilitation Specialist is responsible for entering this data into the Rio Tinto Business Solution.

7.6 STANDARDS OF REPORTING

A separate report is to be prepared for each of the surveys described in **Sections 7.1 to 7.4**, which is to describe the methodology used and the results obtained. The person(s) undertaking the monitoring is/are responsible for preparing the report. The minimum information to be included in these reports must include:

- dates the surveys were undertaken
- persons undertaking the surveys
- any deviations in methodology from those specified in this Threatened Species Management Plan
- discussion of the data in relation to the relevant performance indicator(s) and whether corrective actions should be triggered.

In addition to the individual reports, an annual report will be produced that summarises the findings of the monitoring programs undertaken during the course of the year, and includes any incident reports pertaining to Black-footed Tree-rats. This annual report is to assess the performance of the mitigation measures in place by discussing whether any performance indicators were not met, and the corrective actions taken. The annual progress report is to be compiled by the Rehabilitation Specialist.

8 REVIEW OF SSMP

The Black-footed Tree-rat SSMP is a live document throughout the life of the mine, which will undergo regular formal review. Each review will be undertaken by a suitably qualified ecologist, selected and contracted by Gove Operations. Each new revision of the document will require approval by the Northern Territory Government Department of Environment and Natural Resources prior to its implementation.

The following situations will trigger a revision of the Black-footed Tree-rat SSMP:

- changes to legislation governing the protection of the species and offsetting requirements;
- changes to the conservation status of the species;
- the publication of new data concerning the species' ecological requirements;
- non-compliance with the SSMP;
- the recording of more than one Black-footed Tree-rat within dens in felled trees in a single five-year period;
- data that indicate that the currently prescribed fire frequencies are suboptimal;
- changes to the mine plan on which forecast impacts are based;
- unauthorized activities are proposed and require assessment; and
- every five years, following the compilation of each occupancy model.

Any changes to the Black-footed Tree-rat SSMP must be approved by the Northern Territory Department of Environment and Natural Resources prior to being implemented by Rio Tinto Gove Operations.

Figure 8-1 and 8-2 show the steps to be taken following assessment triggers indicated by a vegetation clearing application (annual/internal assessment), if it has been five years since the previous assessment or if a Change of Life Mine Plan has occurred.

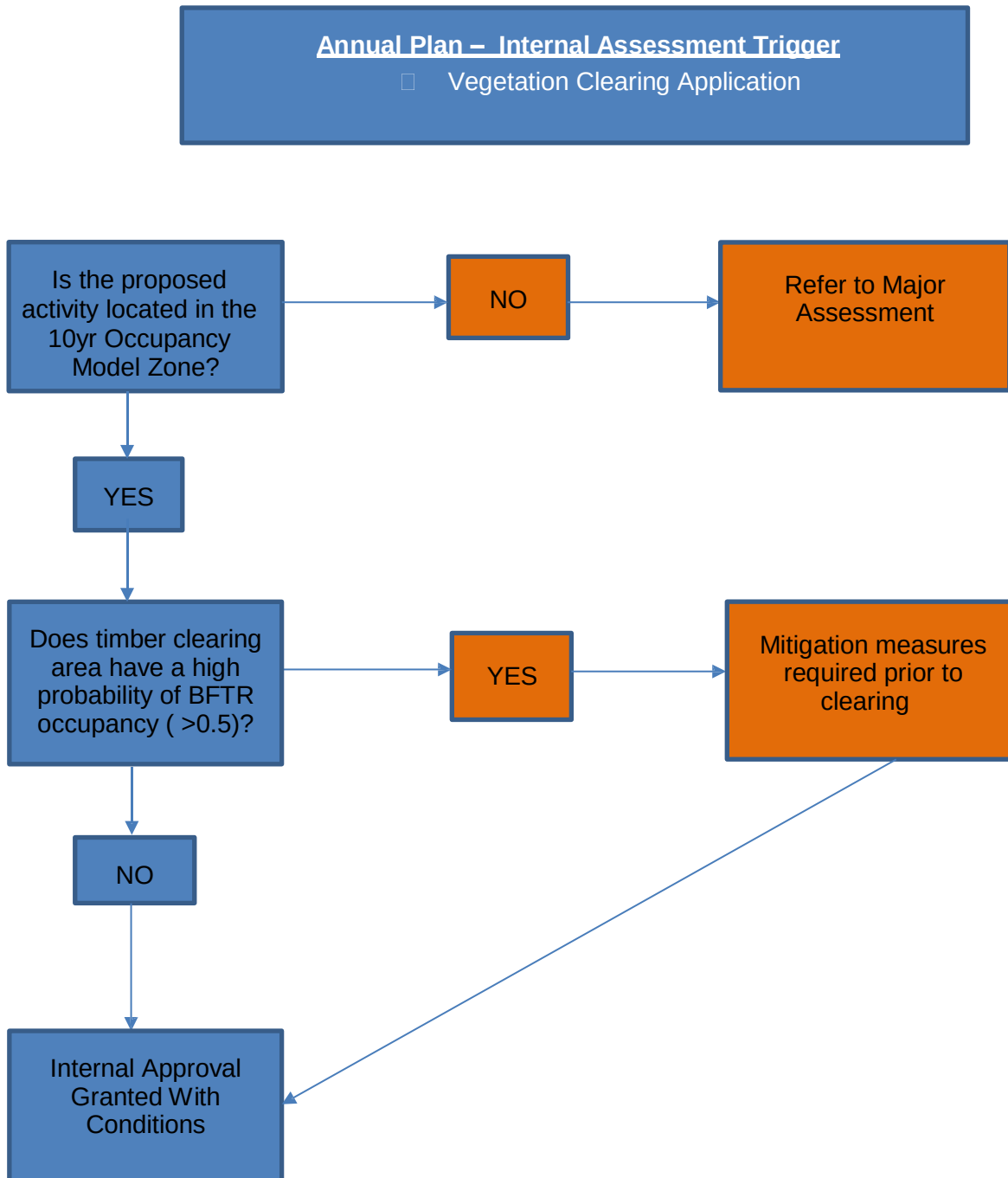


Figure 8-1 Annual Plan - Internal Assessment Trigger Flow Chart

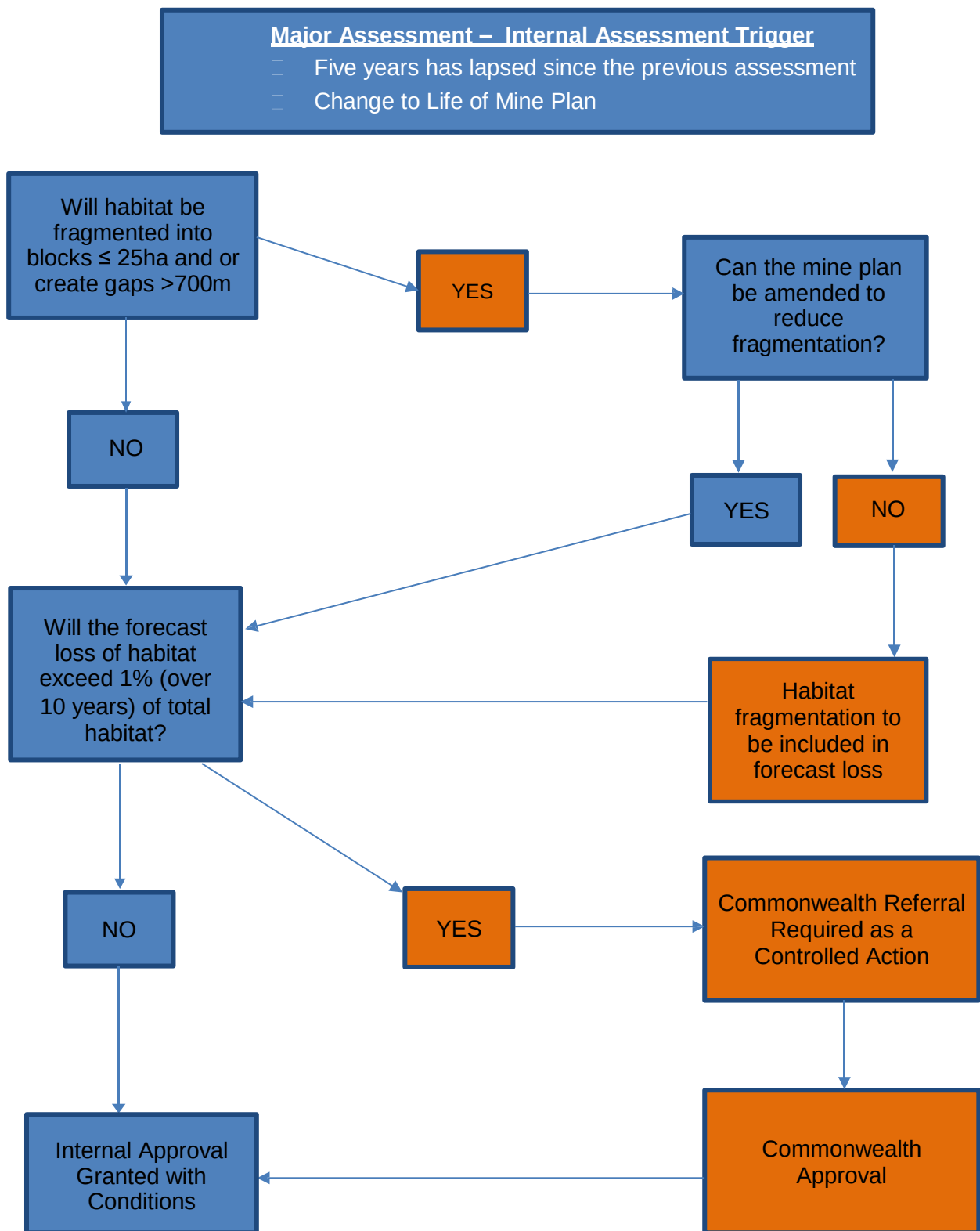


Figure 8-2 Major Assessment - External Assessment Trigger

9 COMPLIANCE

The compliance component of this SSMP will be developed in accordance with any future conditions that are imposed on Rio Tinto Gove Operations by the Northern Territory Government.

9.1 CORRECTIVE ACTION FOR NON-COMPLIANCE

All incidents resulting from unauthorised activities will be investigated by the Environmental Superintendent, and reported to the Northern Territory Department of Environment and Natural Resources. Depending on the severity of the non-compliance, corrective actions for staff found to breach the Black-footed Tree-rat SSMP will range from re-education about their duties under the SSMP to disciplinary action.

If an unauthorised action results from an ineffective control measure, the measure will be adjusted and the SSMP updated accordingly.

9.2 AUDITS

9.2.1 Internal Audits

Rio Tinto Gove Operations will conduct regular system audits with regards to the Black-footed Tree-rat SSMP and activities directly related to it. Annual audits will be carried out by the Environmental Superintendent or their nominated delegate and additional assessments of procedures will occur on an as-needed basis.

9.2.2 Government Audits

The Northern Territory's Department of Environment and Natural Resources will be encouraged to undertake regular audits and assess the progress of the SSMP in consultation with Rio Tinto Gove Operation's staff.

An accepted timeframe for government audits will be decided during discussions between Rio Tinto Gove Operations and staff delegated by the Department of Environment and Natural Resources.

10 ROLES AND RESPONSIBILITIES

The Environmental Superintendent is the main person accountable for all Environmental Management Plans, including this SSMP. The Rehabilitation Specialist is the main person responsible for coordinating the on-ground works of this SSMP. Specific responsibilities for all persons are listed in **Table 10-1**.

Table 10-1 Roles and responsibilities for this SSMP

Roles	Responsibilities
HSE Manager	- Responsible for the outcomes of the SSMP. - Administering disciplinary action in the event of breaches to this SSMP.
Environmental Superintendent	- Initiating audits of Gove Operations with respect to adherence to this SSMP. - Ensuring the requirements of this SSMP are met.
Rehabilitation Specialist	- Implementing the monitoring programs specified in the SSMP. - Ensuring mine rehabilitation achieves the objectives set out in the SSMP. - Overseeing the preparation and implementation of a Fire Management Plan. - Overseeing the implementation of the Weed Management Plan. - Preparing the training material to be used to educate staff on their obligations under the SSMP. - Maintaining a database of all reports arising from the monitoring program, and preparing annual reports summarising the findings.
Mine Superintendent	- Ensuring that mine operation personnel adhere to their responsibilities under the SSMP. - Educating mine operation personnel through tool box meetings. - Managing dust suppression. - Logging incidents related to Black-footed Tree-rats into the Gove Incident Management System.
Mine Operation Personnel and Contractors	- Reporting incidents involving Black-footed Tree-rats to the Mine Supervisor. - Being competent at recognising Black-footed Tree-rats. - Adhering to the Weed Management Plan. - Adhering to site policies regarding eating and smoking in designated areas.
Ecological Contractors	- Undertaking ecological surveys for long-term flora monitoring, 18-month rehabilitation monitoring and occupancy models. - Preparing reports on the findings of surveys. - Using data from occupancy models to forecast impacts of proposed mining on the Black-footed Tree-rat. - Providing technical advice to Rio Tinto Gove Operations for revisions of the SSMP.

These roles and responsibilities have been inserted into an RACI table as per RT Gove policy and for quick reference. This is shown in **Table 10-2**.

Table 10-2 Accountabilities and Responsibilities for the SSMP

SSMP Reference	SSMP Accountabilities and Responsibilities	General Manager	HSE -Business Unit Partner	Manager-Mining	Superintendent-Mine	Specialist Technical - Mining	Specialist - Rehabilitation	Superintendent-Environment	HSE Superintendent	Ecological Service Provider	Mine personnel
1a	Monitoring: Annual Burn scar assessment						R			C	I
1b	Monitoring: Assessment of 18-month-old rehabilitation						R			C	I
1c	Fire Management Plan construction implementation						R			C	I
1d	Monitoring: Long-term flora monitoring of rehabilitation						R			C	I
1e	Monitoring: Camera surveys and occupancy models						R			C	I
2	Weed Management Plan implementation						R				I
3	Database management						R				
4	Annual reports for SSMP						R				
5	Staff training				A		R				I
6	Recognition of and reporting BFTR			R	A	R	R	R	R	I	R
7	SSMP implementation				A		R	A			
8	Review of SSMP									C	
9	Reporting and Compliance	R	R		A						
10	Auditing of SSMP - Internal							A			
11	Administration of disciplinary action								A		

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Appendix: Pre-referral screening tool

Part 1 – General screening questions

Question 1 – inherent hazardous nature of proposal

Is the industry type or activity proposed inherently hazardous with the potential to give rise to multiple or major impact sources and environmental stressors with the potential to impact on the environment? If so, does the nature of the industry preclude impact sources and stressors being substantively reduced?

Question 2 – site selection

Are any environmental values present, or likely to be present within the site/area that has the potential to be impacted by the proposal (either directly, indirectly, or cumulatively)? If so, is it considered impractical to change the locations or design of the action to avoid the environmental value(s)?

Question 3 – construction and operation

Are any environmental values or sensitivities within the area of influence and the region in which the proposal is located likely to be impacted by methods of construction and operation, timing, or inputs (water, raw materials, machinery, chemicals, staff) and outputs (product, emissions, discharges, wastes) of the proposal?

Question 4 – residual or ongoing impacts

Are any environmental values or sensitivities likely to be impacted when the proposal finishes its functional life and closes? If so, does the action have the potential to cause ongoing environmental impacts, or residual impacts?

Question 5 – cumulative impacts

At any stage of the life of the proposal, on its own or cumulatively with other proposals and actions, does the proposal have the potential to impact an environmental value?

Part 2 – Answer checklist

Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
		Is the industry type or activity proposed inherently hazardous with the potential to give rise to multiple or major impact sources and environmental stressors with the potential to impact on the environment? If so, does the nature of the industry preclude impact sources and stressors being substantively reduced?	No X Yes No X Yes				
LAND	1) Landforms <u>Objective:</u> Conserve the variety and integrity of distinctive physical landforms.	- distinctive features in the landscape, either geological or anthropogenic - subterranean karstic terrain and faults - craters, gorges, ranges, caves, massifs, escarpments, plateaus - monuments - tourism related to landforms	Yes No Uncertain Not Applicable	X	X	X	X
	If you answered No to any screening questions for Landforms, provide justification here: The subject area is not a distinctive physical landform.						
	2) Terrestrial environmental quality <u>Objective:</u> Protect the quality and integrity of land and soils so that environmental values are supported and maintained.	- high quality soils, including chemical, physical, biological and aesthetic qualities that support life - the biological processes that depend on soil quality	Yes No Uncertain Not Applicable	X	X	X	X
	If you answered No to any screening questions for Terrestrial environmental quality, provide justification here: High quality soils are not present at subject area.						

Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
WATER	3) Terrestrial ecosystems <u>Objective:</u> Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.	• 'Sensitive or significant' vegetation or buffers (as defined in the NT Land Clearing Guidelines) • listed threatened species and their habitat (NT and Commonwealth) • listed migratory species and their habitat (Commonwealth) • listed threatened ecological communities (Commonwealth) • locally endemic or restricted species and their habitat • species that are data deficient with unknown protection status • protected area or reserve, including Indigenous Protected Area • biosecurity; or high quality biological and functional diversity, integrity and services	Yes No Uncertain Not Applicable	X	X	X	X
	If you answered No to any screening questions for Terrestrial ecosystems, provide justification here: Targeted flora and fauna surveys of the subject area have not recorded any sensitive of significant vegetation, or listed threatened species (NT or Commonwealth), or Commonwealth listed migratory species or threatened ecological communities. The subject area is not located in a protected area or reserve.						
	1) Hydrological processes <u>Objective:</u> Protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.	• the supply and quantity of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, floodplains, mangroves and drainage lines • the supply and quantity of water in groundwater features including aquifers, aquitards, water tables and the ecosystems they support (stygo fauna, vegetation and groundwater dependent ecosystems) • declared beneficial uses • present and future uses, and users of water • current or potential water supplies, including regional scale aquifers • culturally important water features or other features affected by water level	Yes No Uncertain Not Applicable	X	X	X	X
	If you answered No to any screening questions for Hydrological processes, provide justification here: The footprint of the Project does not impinge on any watercourse or wetland, or culturally important water feature. Hydrological regimes would not be changed by the Project. Surface water and groundwater in the subject area are not used by people. Erosion and sediment control measures would be implemented on the site during construction to minimize suspended sediment in runoff.						
	2) Inland water environmental quality	• the quality of water in surface water features including rivers, lakes, wetlands, swamps, creeks, billabongs, intermittent streams, floodplains, mangroves and drainage lines	Yes No	X	X	X	X

Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
	<u>Objective:</u> Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.	- the quality of water in groundwater features including aquifers and water tables - declared beneficial uses - present and future uses and users of water - current or potential water supplies, including regional scale aquifers - potability / drinkability - culturally important water features	Uncertain Not Applicable				
	If you answered No to any screening questions for Inland water environmental quality, provide justification here: The footprint of the Project does not impinge on any watercourse or wetland, or culturally important water feature. Surface water and groundwater in the subject area are not used by people. Erosion and sediment control measures would be implemented on the site during construction to minimize suspended sediment in runoff.						
	3) Aquatic ecosystems <u>Objective:</u> Protect aquatic habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.	- threatened species - the health of the biota in inland waterways - the habitats that support the lifecycle of aquatic biota - groundwater dependent ecosystems - Ramsar wetlands - high quality biological and functional diversity, integrity and services	Yes No Uncertain Not Applicable	 X 	 X 	 X 	 X
	If you answered No to any screening questions for Aquatic ecosystems, provide justification here: The footprint of the Project does not impinge on any watercourse or wetland. Erosion and sediment control measures would be implemented on the site during construction to minimize suspended sediment in runoff.						
SEA	1) Coastal processes <u>Objective:</u> Protect the geophysical and hydrological processes that shape coastal morphology so that the environmental values of the coast are maintained.	- processes that support marine ecosystems such as coral reefs and mangroves - processes that support coastal morphology such as beaches, rock bars, and sandbars - tidal creeks, deltas and river mouths - storm surge protection - unique coastal landforms	Yes No Uncertain Not Applicable	 X 	 X 	 X 	 X
	If you answered No to any screening questions for Coastal processes, provide justification here: The Project is not located in or near a marine ecosystem.						
	2) Marine environmental quality	- quality of the water, sediment and biota - physical parameters that support fishing and aquaculture	Yes				

Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
	Objective: Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.	- physical parameters that support recreation and aesthetics - industrial water supply - cultural and spiritual values	No	X	X	X	X
	If you answered No to any screening questions for Marine environmental quality, provide justification here: The Project is not located in or near a marine ecosystem.						
	3) Marine ecosystems Objective: Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.	- conservation significant marine and coastal fauna and critical habitat such as nesting, breeding or foraging habitat - conservation significant marine and coastal benthos (seagrass meadows, sponge gardens, coral reefs, mangrove communities and salt marshes) - groups of species (species richness and assemblages of species) - ecological functions and processes - high quality biological and functional diversity, integrity and services	Yes				
	If you answered No to any screening questions for Marine ecosystems, provide justification here: The Project is not located in or near a marine ecosystem.						
AIR	1) Air quality Objective: Protect air quality and minimise emissions and their impact so that environmental values are maintained.	- ambient air quality in the local airshed - the chemical, physical and biological characteristics of quality air - the biological processes that depend on the air quality	No	X	X	X	X
	If you answered No to any screening questions for Air quality, provide justification here: The proposed activity may give rise to very short term increases in dust levels during construction. Dust suppression and mitigation measures would be undertaken during construction and a significant impact on the local airshed is very unlikely						
	2) Atmospheric processes Objective: Minimise greenhouse gas emissions so as to contribute to the	- a contribution to the NT's greenhouse gas emissions through nearing or reaching emission thresholds for: - industrial projects of 100 000 tCO₂-e scope 1 emissions per year not counting emissions generated from land clearing	No	X	X	X	X

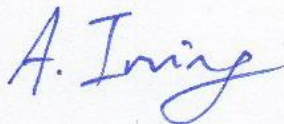
Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
	NT Government's goal of achieving net zero greenhouse gas emissions by 2050.	land use projects of 500 000 tCO₂-e scope 1 emissions from single or cumulative land clearing actions	Uncertain Not Applicable				
	If you answered No to any screening questions for Atmospheric processes, provide justification here: Emissions from the proposed activity are below the threshold.						
PEOPLE	1) Community and economy <u>Objective:</u> Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.	- communities, towns and suburbs where people live - community aspirations for liveable environment and healthy lifestyles, - affordable access to food, water, electricity, transport and communication networks. - good amenity – air quality, noise, aesthetics - access to social infrastructure and services including transport and logistics - access to natural resources including bush food - recreational use of the natural or built environment (e.g. fishing, cycling, sports, picnics) - species of social, cultural, livelihood and or economic importance (terrestrial, aquatic and marine biota) - participation in jobs, businesses and education - existing industries such as agriculture, pastoralism, tourism, fisheries - vulnerable sectors of the community	Yes No Uncertain Not Applicable	X	X	X	X
	If you answered No to any screening questions for Community and economy, provide justification here: The nature and scale of the proposed activity is such that it would not impinge on local residents, local amenity, or the local economy.						
	2) Culture and heritage <u>Objective:</u> Protect culture and heritage.	- Aboriginal cultural values - sacred sites - the Territory's natural and built heritage - declared heritage places and objects protected under the Heritage Act 2011 (NT) such as: - any Aboriginal or Macassan archaeological place or object (coastal mounds and middens, rock art, stone arrangements, quarries, artefacts, graves, burial sites and ancestral remains)	Yes No Uncertain Not Applicable	X	X	X	X

Theme	Environmental factor and objective	Indicative environmental values and sensitivities relevant to each environmental factor	Proponent's answer to screening questions 1-5				
				Q2	Q3	Q4	Q5
		○ underwater cultural heritage (isolated objects, shipwrecks, plane wrecks, underwater cables and evidence of Aboriginal occupation prior to sea level rise) ○ built heritage (colonial buildings and other historic buildings) ○ defence structures (defensive positions and airfields) ○ natural features (meteorite impact sites, palaeontological sites, springs, trees) ○ world heritage ● underwater cultural heritage protected under the Underwater Cultural Heritage Act 2018 (Cth) ● Aboriginal rights and interests, including right of access					
	The subject area has been surveyed and is not considered culturally significant by Traditional Owners. The subject area is located on land where Aboriginal cultural heritage rights and interests are protected though the RTA Gove Traditional Owners Agreement.						
	3) Human health	● drinking water ● air quality ● bush tucker ● radiological limits ● biting insects	Yes				
	<u>Objective:</u> Protect the health of the Northern Territory population.		No	X	X	X	X
			Uncertain				
			Not Applicable				
If you answered No to any screening questions for Human health, provide justification here: The proposed activity would not give rise to any emission or contaminants that would adversely affect human health.							

Record keeping:

	Details
Proponent name	RTA Gove Pty Ltd
Propose action name	Gove Solar Project
Description of proposed action	• Clearing of up to 14.4ha of native vegetation to enable installation of solar panels; • Level ground and install solar panels and transformers; and • Clearing of up to 1.7ha of native vegetation in a corridor and install a 22kV transmission line.

Pre-referral screening has been conducted by: name, qualifications and date of works by suitably qualified and experienced person engaged by the proponent.

Environmental factor	Name	Qualification / Experience	Signature	Date
All	Alan Irving Principal Environmental Consultant Alan Irving & Associates	B.For.Sc. M.Ag.Sc. FAusIMM CP(Env) 40 years environmental management and impact assessment work in the resources sector.		27 February 2024

Solar Site 2

Construction Environmental Management Plan

Effective Date: 26 May 2024

Revision: 2

Prepared By: Scott Porteous

Reviewed By: Andrew Carmichael – Superintendent Environment
Isabel Bryson – Studies Adviser

Approved By: Brad Warner – HSE Business Partner
Greg Powe – Project Lead

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1. Overview

1.1 Purpose

This Construction Environmental Management Plan (CEMP) provides a framework for the management of activities that have the potential to impact the environment during the clearing and fencing of a 14.4 ha site on the Mine Lease for the future construction of a solar farm. The clearing activities will also create a corridor from the solar farm site to the 22kV Town Feeder (1.6 ha).

Some of the clearing activities can potentially cause environmental disturbances to the surroundings, and as such, the CEMP provides a guide to mitigating the associated risks.

1.2 Project Description

A Solar Farm will ultimately be built and operated on the site by a third party with RTA Gove purchasing the electricity generated from the facility. **The scope of this CEMP is for the clearing and fencing of the external boundary of the site, and the construction of all-weather access roads.**

1.2.1 Clearing

The vegetation removal in the area below will occur in accordance with the Northern Territory land clearing guidelines, which state that land should not be cleared on imperfectly to poorly drained soils or in areas of very high erosion unless detailed erosion and sediment control is undertaken. The following erosion and sediment control measures will be implemented during and immediately following vegetation removal:

- Ground disturbance and clearing activities conducted during the dry season to mitigate the risk of soil erosion and sediment loss from the project area.
- Minimising mechanical disturbance during clearing.
- Erosion and sediment control measures, including silt fences and bunding.
- Erect temporary fencing or flagging tape where there is a possibility of encroaching on vegetation outside the approved clearing area or construction activities.

1.2.2 Fencing

A new security fence and gated access will be installed around the site perimeter.

1.2.3 Access roads

All weather access roads and driveways will be installed.

1.3 Definitions

Table 1: Abbreviations

Term	Definition
AS/NZS	Australian & New Zealand Standards
CEMP	Construction Environmental Management Plan
EPA	Environmental Protection Agency
ISO	International Organization for Standardization
NT	Northern Territory
RTA	Rio Tinto Aluminium

Table 2: List of Terms

Term	Definition
Environmental Impact	The harm that has occurred, or has the potential to happen, to the surroundings in which we operate, including air, water, land, natural resources, flora, and fauna.
Incident	A single event, continuous or repetitive series of events that results in, or could have resulted in, one or more of the following impacts: • Occupational injury or illness • Damage to physical assets, the environment, process, product, or reputation • Disruption to a community • Exposure to legal liability • Security threat
Non-Compliance	A form of incident where a business or site experiences a failure to meet external requirements such as legal or other requirements.
Non-Conformance	A type of incident where a business or site experiences a failure to meet internal requirements.
Suitably Qualified Professional	A person who is a Registered Professional and has demonstrated competency and relevant experience.
Area	An area or process building within the proposed site.
Contamination	About land, water, or a site, having a substance present in or on the ground, water or site at above background concentrations that present, or has the potential to present, a risk of harm to human health, the environment, or any environmental value.
Fresh Water	Water that is naturally occurring and contains low concentrations of dissolved salts and other total dissolved solids.
Remediation	Work done to remove, contain, or otherwise mitigate contamination in soil or water to reduce risk to an acceptable level.
Surface Water	Water flows over ground surfaces and in natural streams and drains as a direct result of rainfall over a catchment.

2. Regulatory and Corporate Framework

2.1 Legislation, Regulations and Standards

The applicable statutory and regulatory requirements that must be complied with, but not limited to, are listed below.

2.1.1 Northern Territory Legislation

- *Aboriginal Land Act 1978*
- *Biological Control Act 2016*
- *Bushfires Management Act 2016*
- *Building Act 1993*
- *Control of Roads Act 1953*
- *Dangerous Goods Act 1998*
- *Environmental Assessment Act 1982*
- *Environmental Offences and Penalties Act 1996*
- *Environment Protection Act 2019*
- *Fire and Emergency Act 1996*
- *Heritage Act 2011*
- *National Environment Protection Council (Northern Territory) Act 1994*
- *Northern Territory Aboriginal Sacred Sites Act 1989*
- *Mining Management Act 2001*
- *Mineral Titles Act 2010*
- *Plant Health Act 2008*
- *Soil Conservation and Land Utilisation Act 1969*
- *Territory Parks and Wildlife Conservation Act 1976*
- *Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010*
- *Waste Management and Pollution Control Act 1998*
- *Water Act 1992*
- *Water Legislation Amendment Act 2018*
- *Weeds Management Act 2001*
- *Work Health and Safety (National Uniform Legislation) Act 2011*

2.1.2 Northern Territory Regulations

- Building Regulations
- Dangerous Goods Regulations
- Environmental Offences and Penalties Regulations
- Fire and Emergency Regulations

- Heritage Regulations
- Territory Parks and Wildlife Conservation By-Laws
- Territory Parks and Wildlife Conservation Regulations
- Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations
- Waste Management and Pollution Control (Administration) Regulations
- Water Regulations
- Weeds Management Regulations
- Work Health and Safety (National Uniform Legislation) Regulations

2.1.3 Federal Legislation

- *Aboriginal and Torres Strait Islander Act 2005*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Aboriginal Land Rights (Northern Territory) Act 1976*
- *Australian Heritage Council Act 2003*
- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- *Native Title Act 1993*
- *National Environment Protection Council Act 1994*

2.1.4 Federal Regulations

- Aboriginal and Torres Strait Islander Heritage Protection Regulations
- Aboriginal Land Rights (Northern Territory) (Land Description) Regulations
- Aboriginal Land Rights (Northern Territory) Regulations
- Environment Protection and Biodiversity Conservation Regulations

2.1.5 Australian Standards

- AS/NZS/ISO 14001 Environmental management systems - Requirements with guidance for use
- AS490 - 2009 Protection of trees on development sites
- AS 2436 Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites

2.1.6 Other Publications

- International Erosion Control Association (IECA) Australasia Best Practice Erosion and Sediment Control
- Northern Territory Natural Resource Management Plan – Top End Region 2021-2025 (Territory Natural Resource Management, 2021)
- ISO 19011:2018 Guidelines for auditing management systems
- Leading Practice Sustainable Development Program for the Mining Industry (Australian Government, 2016)
- Northern Territory Land Clearing Guidelines (Northern Territory Government, 2021)
- Northern Territory Noise Management Framework Guideline (NT EPA, 2018)

- Environmental Noise Management Manual (RTA, 2001)
- Declared weeds of the Northern Territory (NT Government, 2019)
- Prevent Pollution from Building Sites (NT EPA, 2015)

2.2 Gove Traditional Owners Agreement

In 2011, the Gove Traditional Owners Agreement was signed by the Gumatj, Rirratjingu and Galpu Traditional Owners, the Northern Land Council and Rio Tinto. The Agreement formally acknowledges the Traditional Owners and lays the foundation for intergenerational benefits and sustainable economic, cultural, social, and environmental outcomes for the signatory Traditional Owner groups and communities.

3. Environmental Management Approach

3.1 Roles and Responsibilities

3.1.1 Contractor Supervisor

A suitably qualified person (the Contractor Supervisor) will have responsibility for the Solar Farm site area development construction works and work directly with the Civil Works Contractor/s. These responsibilities include:

- Fuel and oil spill prevention
- Noise Management
- Air Quality
- Fauna
- Vegetation Clearing
- Pest Management
- Waste Management
- Cultural Heritage

3.1.2 Civil Works Contractor/s

The Civil Works Contractor/s will report to the Contractor Supervisor. Typical Civil Works Contractor/s roles and responsibilities for environmental management are included in **Table 3**.

Table 3 Typical Civil Works Contractor/s Project Roles and Responsibilities

Position	Role Description
Civil Works Contractor/s Site Nominated Leader	• Reviews and implements the requirements of the CEMP. • Maintains regular/daily communications with the Contractor Supervisor. • Communicates environmental requirements, obligations and site-specific environmental issues to all project personnel and subcontractors. • Ensure non-compliances and non-conformances are identified, investigated, recorded, and reported. • Coordinate emergency action and allocate required resources. • Report to the Contractor Supervisor any activity that has resulted, or has the potential to result, in an environmental incident. • Initiate action in the event of an environmental incident or emergency and allocate required resources to deal with the incident/emergency. • Participate in reviews of the CEMP.

Position	Role Description
Civil Works Contractor/s HSE Manager	- Reviews and inputs to the CEMP. - Oversee the Civil Works Contractor/s site induction process and implement all Civil Works Contractor/s safety systems. - Coordinate regular HSE reviews. - Support the project management team in promoting an incident and injury-free work culture. - Provision of expert advice and coaching in developing Safe Work Method Statements (SWMS), project risk assessments, or Job Safety and Environmental Risk Assessment (JSERA). - Ensure applicable legal, approval and project environmental obligations are complied with. - Ensure project staff have the necessary skills and training for their roles and have been instructed and understand the environmental requirements relevant to their scope of work and area. - Ensure the necessary resources and processes are in place to implement environmental controls. - Ensure the Civil Works Contractor/s Site Nominated Leader is familiar with their responsibilities concerning environmental obligations, project approvals, and associated documents.
Civil Works Contractor/s Environmental Lead (if applicable)	- Periodic review of site activities and their impact on the environment. - Provide support in the assessment of asset risk ranking. - Review and revise periodically or as required the ecological work method statements for Project activities prepared by Civil and sub-contractors. - Develop environmental site induction and toolbox talk information to present to site personnel and the requirements of their work activities. - Conduct internal environmental compliance audits. - Investigate and ensure resolution and close out any non-compliances.
Civil Works Contractor/s staff and Subcontractors	- All project staff (including subcontractors) have a general environmental duty of care and are responsible for their environmental performance while on the project. As a minimum, all personnel are required to: - Attend daily pre-start / toolbox meetings. - Carry out all activities in an environmentally responsible manner. - Attend environmental inductions and training relevant to their role and responsibilities. - Carry out all activities according to the SWMS/JSERAs. - Report any activity that has resulted in, or has the potential to result in, an environmental incident immediately to the Contractor Supervisor. - Identify and report non-conformances and implement corrective and preventative action as the Contractor Supervisor instructs.

3.2 Environmental Induction and Ongoing Training

Before commencing work on site, all project personnel, including subcontractors, will complete the site-specific induction, including any environmentally sensitive areas, identified cultural sites of significance, Sacred Sites or Restricted Works Areas (RWAs) and environmental responsibilities.

Additional training will be provided to ensure all Civil Works Contractor/s site works comply with statutory requirements, site environmental approvals, licenses and permits.

3.3 Reporting, Data and Record Management

Reporting, data, and record management will be undertaken, and reporting shall be supplemented with photographic evidence whenever possible.

3.4 Community Consultation and Complaints Handling

Communication with external stakeholders will be undertaken prior to the commencement of work. Any environmental complaint will be investigated, and any remedial action will be implemented as soon as practicable. This may include the Civil Works Contractor/s incorporating additional controls, mitigation measures and monitoring into the CEMP.

3.5 Emergency Response

Environmental incidents (such as spills) and emergencies may occur, and management controls will be in place to ensure they are managed effectively. The resources and strategies needed to respond to an incident are to be identified and readily available.

Emergency services, including a hospital with an emergency department, are located within the township of Nhulunbuy. Emergency contact details are to be presented in the site induction and provided to all staff and contractors.

The Civil Works Contractor/s CEMP will contain contact information regarding the Civil Works Contractor/s, local Emergency Services, and any additional specific Solar Farm site area development project emergency contacts.

3.6 Incident reporting

In the case of a notifiable environmental non-compliance, the NT regulator will be notified within the required timeframe.

Records of all incidents will be maintained with relevant details, photographs, and location.

4. Environmental and Cultural Heritage Aspects and Controls

4.1 Aspects and Management Strategies

Aspects for which management objectives and targets are to be provided include:

- Cultural heritage.
- Social and community.
- Soils and erosion and sediment control.
- Hazardous materials & waste.
- Air quality.
- Noise, vibration, and lighting.
- Terrestrial flora, fauna, and habitat disturbance.

4.2 Cultural Heritage

4.2.1 Objectives

Critical points required to ensure the protection and ongoing management of cultural heritage sites in and near the project area are:

- Before any land disturbance, consideration must be given to cultural heritage sites, including Indigenous sacred sites and Indigenous and non-Indigenous heritage sites (e.g., archaeological sites).
- Before any land disturbance, a check of cultural, heritage and community impacts must be gauged.
- The Aboriginal Areas Protection Authority (AAPA) is appointed by the Administrator of the Northern Territory to establish and maintain the Register of Sacred Sites and to facilitate discussion between custodians of sacred sites and persons performing or proposing to perform work on or use land in the vicinity of a sacred site.
- The *Heritage Act 2011* protects all Indigenous archaeological places, objects, and general heritage.
- *Northern Territory Aboriginal Sacred Sites Act 1989*, *Aboriginal Land Rights Act 1976*, and

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 protect all Aboriginal sacred sites.

- The *Environmental Protection and Biodiversity Conservation Act 1999* protects general heritage places.

Other aspects of cultural heritage that are to be considered and further developed as the Solar Farm site work progresses are included in **Table** .

Table 4 Cultural Heritage Implementation Strategy

Cultural Heritage Implementation Strategy	
Objective	• Maintain cultural heritage values of the region, both Indigenous and non-Indigenous.
Target(s)	• Comply with all site AAPA certificate requirements. • Avoid disturbing and damaging Aboriginal or cultural heritage artefacts or Sacred Sites. • Minimise impacts upon or disruption to activities of Indigenous stakeholders in culturally significant areas.
Sources	• Direct or indirect disturbance from clearing and landscaping.
Management strategies	• Comprehensive cultural heritage information included in the mandatory site induction.
Monitoring	• Auditing as required.
Responsibility	• Contractor Supervisor • Civil Works Contractor/s/s
Associated Documents	• AAPA Certificate C2008/231 • AAPA Certificate C2011/207 • Site Induction

4.3 Social and Community

Stakeholder engagement is a key component of this project. Early and continuous engagement with stakeholders allows for the management of stakeholder expectations and the identification of potential risks associated with the Solar Farm project.

Regular engagement with internal stakeholders ensures consistency in implementing the Solar Farm project strategy on-site and identifies lessons learnt on previous projects that can help inform the current project or activities.

Various potential environmental impacts of activities on the surrounding communities are included within the following sections. Any community complaints received will be managed as according to **Section 3.4**.

4.4 Erosion and Sediment Control

Based on preliminary site-specific geotechnical investigations and the low gradient topography, there is a low risk of erosion and sediment loss in the project area. As such, a site-specific certified Erosion and Sediment Control Plan (ESCP) is not required at this stage. However localised erosion and sediment controls will need to be implemented during clearing and fencing activities as detailed in **Table 5**. Undertaking land disturbance and clearing activities during the dry season is the principal control for managing potential erosion and sediment loss.

Table 5 Erosion and Sediment Control Implementation Strategy

Erosion and Sediment Control Implementation Strategy	
Environmental objective	• Avoid erosion and prevent sediment-laden surface water from leaving the site and entering downstream creeks and marine waters.
Target(s)	• No increase in erosion on the site or adjacent land during Project activities. • No degradation in surface water quality (related specifically to erosion and sediment control issues) off-site because of Project activities.
Sources	• Land disturbance and clearing required during the Solar Farm site area development program. • Erosion of drainage channels.

Erosion and Sediment Control Implementation Strategy	
Management strategies	- Ground disturbance and clearing activities conducted during the dry season to mitigate the risk of soil erosion and sediment loss from the project area. - Dependent on further pre-clearing environmental assessments, the Civil Works Contractor/s may need to implement additional localised erosion and sediment controls including silt fences, bunding and sediment traps. - Civil Works Contractor/s to maintain and inspect erosion and sediment control and drainage structures regularly to keep them effective. - Stop working during heavy rainfall events and inspect the work area following rainfall events.
Monitoring	- Regular inspections by the Civil Contractor/s will ensure that any potential erosion and sediment management control problems and issues are addressed as quickly as possible. The Contractor Supervisor and the Civil Contractor/s may need to track weather forecasts for potential periods of rain or high winds and plan actions accordingly. - The Contractor Supervisor may be required to engage the site Environmental Department to monitor surface water runoff including pH and turbidity field parameters and conduct regular water quality monitoring following a rainfall event or where risk of erosion and sediment loss is identified. - Weekly, or as soon as practical or safe to access, following rainfall events (>20mm) - Site inspections of all erosion, drainage and sediment control structures and devices for structural integrity and capacity. - Regular cleaning and de-silting of sediment control devices to maintain design capacity. - Emptying the sediment traps as soon as possible after rainfall events in preparation for subsequent rainfall events.
Corrective actions	- Rectification of damaged erosion and sediment control structures to be undertaken in a timely manner. - Any event that has the potential to increase sediment or release water off-site must be reported to the Contractor Supervisor. - Where control structures do not provide adequate results in controlling stormwater, and there exists the possibility of an ongoing impact on the surrounding environment, consultation with the Contractor Supervisor will be sought to implement controls to supplement proposed or existing controls. Controls may include cessation of work in the affected area for as long as is required to rectify erosion, sedimentation, or contamination issues. They may also include, where appropriate, a modification to the work program.
Responsibility	The Civil Works Contractor/s must report any damage that could lead to erosion or pollution incidents to the Contractor Supervisor immediately, as regulators may require notification within 24 hours.

4.5 Waste

Any general waste that results from the project will be handled in accordance with the required regulations, utilising locally available resources where available.

4.6 Air Quality

Air quality could be impacted during the Solar Farm site works. Sources include earthworks, haulage and travel on unsealed roads, and emissions from plants and machinery. Increased emissions from naturally occurring offsite dry season bushfires will continue during the works.

Environmental receptors impacted by dust emissions generated during the Solar Farm operations include nearby vegetation ecosystems.

Air quality monitoring will be implemented at critical locations to inform air quality management, if required, throughout the work. Standard mitigation measures are included in **Table 6**.

Table 6 Air Quality Implementation Strategy

Air Quality Implementation Strategy	
Environmental objectives	Minimise the release of fugitive emissions into the air from areas where construction activities occur.
Target(s)	Minimise dust generation during construction activity.

Air Quality Implementation Strategy	
	- Minimise the release of fugitive emissions into the air from areas where construction activities occur. - Achievement of best practice dust standards at sensitive receptor monitoring locations. - No complaints from surrounding communities regarding dust and emissions.
Sources	- Dust from earthworks and bare surfaces. - Vehicle movements on unsealed roads. - Emissions from plants, vehicles, and machinery.
Management strategies	- If required, Civil Works Contractor/s shall carry out suitable dust suppression measures to limit dust nuisance on and off the site. - Monitor ground and wind conditions to prevent nuisance dust emissions before they occur. - Stop and reschedule clearing and earthworks activities during high winds if dust is blowing off-site. - Proactively respond to external complaints and keep dust levels within acceptable limits.
Monitoring	Monitoring will be conducted in accordance with Australian Standard 3580.
Corrective actions	- Should a community or internal complaint be received: - Ascertain whether Solar Farm site activities are the likely source of the dust/emissions, and if so, identify the source(s). - Review air quality mitigation and monitoring strategies and amend as required.
Responsibility	The Civil Works Contractor/s will be responsible for ensuring activities operate within air quality guidelines and, in the event of a complaint, actioning controls in coordination with the Contractor Supervisor to alleviate the complaint in a timely manner.

4.7 Terrestrial Flora, Fauna, and Native Habitat Disturbance

Despite vegetation not being considered significant in the Solar Farm site area due to the previous disturbances including exploration drilling, some regenerated areas may provide habitat for threatened flora and fauna species.

Mitigation measures for flora, fauna and habitat clearing are included in **Table 7**.

Table 7 Terrestrial Flora, Fauna, and Native Habitat Disturbance Implementation Strategy

Terrestrial Flora, Fauna, and Native Habitat Disturbance Implementation Strategy	
Environmental objective	- To minimise the effect of the Solar Farm site development works on flora and fauna. - To minimise the potential for weed introduction or spread due to the Solar Farm site construction activities. - To retain a wildlife corridor between the hinterland and the coast to support species conservation.
Target(s)	- No clearing of native vegetation or land disturbance outside the approved clearing footprints. - No new species of noxious weed or feral animals or the spread of existing species. - No incidents of fish or bird kills or mammal mortalities.
Sources	- Land clearing within the Solar Farm site area to source materials from within the identified 16.1ha footprint. - Land clearing within the Solar Farm site area to investigate and maintain access tracks.
Management strategies	- Where practicable, area vegetation clearing should occur outside the breeding season of local birds, ideally between December and March. - If the clearing cannot occur during the wet season for practical reasons, it is recommended that the nest trees cleared in the following dry season should be felled in the prior wet season while none are active. - Erect temporary fencing or flagging tape where there is a possibility of encroaching on vegetation outside of the approved clearing area or construction activities. - Vegetation to be cleared sequentially to encourage fauna to move out of the development area and into adjacent retained vegetation areas. - Hollow-bearing trees and those with active nests are to be left standing for a minimum period of 24 hours after the surrounding vegetation is cleared before the second stage of clearing. - If trenches are to be left open overnight, in addition to barricading, provide one end of the trenches battered down as a ramp to enable fauna to escape. - It is prohibited to destroy, take, kill, or unnecessarily disturb any animals. - Controls on activities or facilities that might disturb native fauna feeding and reproduction cycles (e.g., noise, nocturnal lighting).

Terrestrial Flora, Fauna, and Native Habitat Disturbance Implementation Strategy	
	- Be aware that fauna such as snakes, other reptiles, native mammals, and marsupials can become trapped in materials on site. - Be aware that buffalos may use wet and open excavation areas as a wallow. Do not approach buffalos as they are dangerous, and report sightings to the Contractor Supervisor. - Vehicles/machinery travel only on defined access tracks/haul roads unless in an emergency or unsafe situation. - Ensure all operators have received an induction on black-footed tree rats, either as part of their mine induction or, alternatively a plantation project-specific induction. Animals with the potential to harm people - There are many species of fauna, both native and introduced, that have the potential to harm personnel on-site and around the Gove Peninsula. Mitigation strategies to minimise injury to site personnel should be considered and included in task SWMS/JSERAs.
Monitoring	- Monitor clearing and ensure cleared areas are not larger than necessary for construction purposes. - Any injury or death of fauna within the Solar Farm site Area shall be reported to the Contractor Supervisor. Known causes of death of fauna should also be noted.
Responsibility	If any endangered or threatened species are found within the clearing or construction zone, work shall immediately stop and the Contractor Supervisor informed.

4.8 Pests and Feral Species

Without a high standard of prevention, detection and mitigation, animal pests can destroy rehabilitation and surrounding vegetation by trampling, grazing, and displacing native animals.

Key animal pests in the Gove region include Yellow Crazy Ants, Water Buffalo, Feral Pig, Feral Cat, and Cane Toads. Other pest species include mosquitos and sandflies.

Implementation strategies for pest and feral species control are presented in **Table 8**.

Table 8 Pests and Feral Species Implementation Strategy

Pests and Feral Species Implementation Strategy	
Environmental objective	Ensure the Solar Farm site development works minimise the introduction or spread of pest and feral species within and adjacent to the site.
Target(s)	- Prevent the occurrence of additional water bodies that create mosquito and cane toad breeding habitats. - No new pest species or feral animals or increase in existing populations. - No introduction of pest species known on the Gove Peninsula.
Sources	- Weed seeds or pest species introduced by vehicles and machinery mobilised to the site. - Weed seeds or pest species spread around the site by vehicles and machinery. - Incorrectly disposed food waste attracts fauna and pest species. - Water-retaining containers attract fauna and pest species. - Pigs, buffalo, cats and dogs inhabit the Mine and surrounding areas.
Pest and Feral Species Management Strategies	- Sightings of feral or pest species should be reported to the Contractor Supervisor. - Waste management and housekeeping to minimise attraction of animals to food waste around office and laydown areas. Mosquitoes and Sandflies Prevent the occurrence of potential mosquito breeding sites and the presence of adult mosquitoes by: - Wherever possible, drain slopes from temporary depressions created during the Solar Farm site development works so they cannot hold water. - Drain standing pools by cutting a drain to grade as appropriate. - The project site shall be free of water-holding receptacles, e.g., tyres, stockpiled plastic sheeting, wheel ruts, etc. - Report primary mosquito and larvae infestations so a mosquito pest control contractor can be arranged. - Ensure the Solar Farm site area floors do not intercept natural groundwater tables. Yellow Crazy Ants

Pests and Feral Species Implementation Strategy	
	- Educate personnel to identify Yellow Crazy Ants by sight, behaviour, and specific Yellow Crazy Ants objectives. - Immediately report any sighting of Yellow Crazy Ants, swarms, or nests to the Contractor Supervisor. - Note: Swarming behaviour may be triggered by removing vegetation or rocks above the underground nest. - All project personnel to be aware of the risk of spreading Yellow Crazy Ants. - Should Yellow Crazy Ant colonies be encountered, machinery and vehicle movement will be halted, and the area flagged out. All vehicles and machinery will be inspected and cleaned as necessary before being allowed to leave the site. Animals with the potential to harm people - There are many species of fauna, both native and introduced, that have the potential to harm personnel on-site and around the Gove Peninsula. Mitigation strategies to minimise injury to site personnel should be considered and included in task SWMS/JSERAs. Weeds - Weeds are managed as per the NT Weed Management Act. - Targeted Weed Management Action Plans will be implemented if NT declared weeds are encountered during construction activities.
Monitoring	- A feral and pest register should be maintained on-site to record all feral and pest species sightings. - Any introduced fauna incursions are addressed as soon as practicable to maximise the success of site rehabilitation.
Responsibility	- Civil Works Contractor/s to inform Contractor Supervisor of pest and feral species sightings. - Contractor Supervisor to coordinate pest and feral species control.

LEVEL 2 RISK ASSESSMENT TOOL

Date

26/02/2024

Area

Mining Lease

Name

Solar Site 2

Team

RTA Gove

Part B - Conducting a Risk Assessment					Current Risk				Predicted Risk		
Work Area	Hazard / Aspect	Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Planned Contols / actions	Consequence	Likelihood	Risk Rating
Mine Management Plan	Legal/community	Construction of solar farm	Not an Authorised Activity		4-Major	A-Almost certain	Critical	Submit new MMP and associated documents (L2RA, CEMP) for area Approval from the Regulator	1-Minor	D-Unlikely	Low
Mine/Solar Farm 2 Site	Electrical/Mechanical/Underground services/Telecommunication and fibre	Interaction with underground HV cable or HP water	Machinery breaking the surface	Excavation survey/permit prior to test drilling on the site	3-Serious	C-Possible	High	Confirm that no new services have been installed Excavation permit Potholing of services via Vac Truck, once found	3-Serious	D-Unlikely	Moderate
Mine/Solar Farm 2 Site	Enviromental/Land clearing and earthworks	Potential for uncontrolled runoff, erosion and sedimentation of surface waters	Rain event causes loss of control	Mine stormwater management infrastructure	2-Medium	C-Possible	Moderate	Conduct activities in the dry season Construction of stormwater management infrastructure and erosion protection such as vegetation, silt fences or geofabric Construction Environmental Management Plan (CEMP)	2-Medium	D-Unlikely	Low
Mine/Solar Farm 2 Site	Enviromental/Land clearing and earthworks	Distruction/damage to flora and fauna	Machinery/individual interaction with flora and fauna	Site previously cleared/disturbed (no significant habitat remains) Flora and fauna surveys conducted prior to drilling activities on the site Significant Species Management Plan (Black-footed Tree-rat) Vegetation clearing permit process	3-Serious	C-Possible	High	Completion of operator self-assessment of the environmental impact	3-Serious	D-Unlikely	Moderate
Mine/Solar Farm 2 Site	Environmental/Land clearing and earthworks	Spreading of invasive species	Machinery/individual interaction with soil/vegetation infested with Yellow Crazy Ant (YCA)	Machine & equipment hygiene inspection and clearance for heavy and light vehicles Report sightings YCA Awareness Training Vegetation clearing permit	3-Serious	C-Possible	High	Project expectations meeting Apply hygiene inspection and clearance process for all machine equipment and vehicles entering and leaving the work area	3-Serious	D-Unlikely	Moderate
Mine/Solar Farm 2 Site	Cultural/Land clearing and earthworks	Distruction/damage to cultural heritage site/artifacts	Machinery/individual interaction with cultural heritage	Site previously cleared/disturbed (no cultural heritage issues identified) Cultural heritage survey conducted prior to drilling activities on the site Cultural heritage permit	1-Minor	D-Unlikely	Low	No further controls required			

LEVEL 2 RISK ASSESSMENT TOOL

Date

26/02/2024

Area

Mining Lease

Name

Solar Site 2

Team

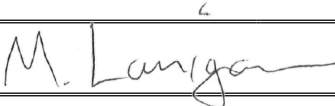
RTA Gove

Part B - Conducting a Risk Assessment					Current Risk				Predicted Risk		
Work Area	Hazard / Aspect	Risk Scenario	Causes	Existing Controls	Consequence	Likelihood	Risk Rating	Planned Contols / actions	Consequence	Likelihood	Risk Rating
Mine/Solar Farm 2 Site	Community/Construction of acces road(s) and fencing	Dust generated impacts surrounding areas	Machinery generates dust	Site HSE procedures Location is not close to other users	1-Minor	D-Unlikely	Low	Inform surrounding businesses/individuals of activity - communication with community through Facebook Controls to take account of prevailing winds Monitor and water suppression if required	1-Minor	D-Unlikely	Low
Mine/Solar Farm 2 Site	Community/Construction of access road(s) and fencing	Noise generated impacts surrounding areas	Machinery generates noise	Site HSE procedures Location is not close to other users	1-Minor	D-Unlikely	Low	Inform surrounding businesses/individuals of activity - communication with community through Facebook Monitor and change work practices if required	1-Minor	D-Unlikely	Low
Mine/Solar Farm 2 Site	Vehicle interation/Construction of access road(s) and fencing	Vehicle collision/rollover or interaction with individual	Vehicle hits worker	Critical Risk Management (CRM) Site safety procedures Heavy machinery licences and training V Ops	4-Major	C-Possible	Critical	Work group engaged to undertake the work undertakes a risk assessment prior to commencing the work and controls to include: -Traffic management Plan -CRM -Site safety procedures -Heavy machinery licences and training -Spotters -RTAG Site supervision -Comms - radios, call signs -Work area management - physical barricading, only one entry point -Project meeting to set expectations	4-Major	D-Unlikely	High
Mine/Solar Farm 2 Site	Mechanical/Construction of access road(s) and fencing	Crushing, cutting, grinding, impact, pinch points, suspended loads, use of augers, ergonomics	Injury during fence construction	Site HSE procedures	2-Medium	C-Possible	Moderate	Work group engaged to untake the work undertakes a risk assessment prior to commencing the work and controls to include: -CRM -site safety procedures -Toolboxes -Project meeting to set expectations	2-Medium	D-Unlikely	Low
Mine/Solar Farm 2 Site	Work Environment/Construction of access road(s) and fencing	Worker impacted by workplace conditions or physical environment	Health illness/fatigue	Site HSE procedures	3-Serious	C-Possible	High	Work group engaged to untake the work undertakes a risk assessment prior to commencing the work and controls to include: -Work Area Management -Hydration training/testing -Sun protection -Shade/cool down area -Toolboxes & prestarts -Project meeting to set expectations -CRM	3-Serious	D-Unlikely	Moderate



14138 RTA Gove Pty Limited Solar Farm Site 2
Environmental Management Plan

Revision History (Specific to Project)

Rev.	Rev. Date	Details of Changes	Prepared By	Approved By
A	15/04/2024	Initial Document	George Anestopoulos	Matt Hunter
Final Sign Off – Name: Matthew Lanigan			Signed: 	
Acceptance – Name: Rio Tinto Project Lead Greg Powe			Signed: 	04/06/2024



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1.0 INTRODUCTION

This Construction Environmental Management Plan (CEMP) applies to the Aggreko Solar Farm Site 2 at Rio Tinto Gove in the Northern Territory, Australia.

The CEMP covers all environmental aspects and impacts pertaining to Aggreko's activities of which it creates, controls or has reasonable influence over. These include:

- Current, past and proposed future activities.
- Normal, abnormal, or reasonably foreseeable emergency conditions.

The plan also applies to those indirect aspects arising from works carried out by Aggreko's suppliers and contractors.

The plan has been developed to protect, preserve and limit the impact to the environment during work activities being conducted on a 14.4 ha Mine lease to construct a Solar Farm, while adhering to (and where able, exceeding) legislation, statutory regulations and standards.

All employees, contractors and visitors will be advised of our environmental obligations and the effect our operations could have upon the environment.

Our site QUALITY, HEALTH, SAFETY and ENVIRONMENT POLICY is set out as follows:

All site engaged employees and contractors will attend basic safety and environmental training prior to commencement of the project, by way of participating in:

- Any applicable client or principal contractor's inductions as required.
- Aggreko HSEMS procedures encompassing training and local Health, Safety and Environmental Regulations.

The plan defines the practices, resources, activities and responsibilities associated with all stages of the project (installation, operation, commissioning and maintenance).

If there is any conflict between this document and the customer's Environmental Management Plan, the customer's instructions take precedence.

All elements of this plan will comply with the relevant legislative requirements, applicable approved codes of practice and relevant AS/NZ Standards.

Civil works are excluded from Aggreko's scope of work and are the responsibility of Rio Tinto – Gove. Rio Tinto Gove Operations will be responsible for the establishment of the site and all civil construction works such as the site egress, water diversion, storm water dispersion/retention and perimeter fencing.



2.0 AGGREKO GROUP ENVIRONMENT POLICY

aggreko

Safety for life

Group Environment Policy Statement

This speaks to direct environmental impact and not to the wider environmental considerations associated with our carbon footprint.

The sentence below does rectify this to a small extent.

We recognize our key environmental impacts are in; generation of energy, fuel management, transportation of equipment and movement of people.

Each of our businesses, our employees and our business partners are required to embrace this policy and comply with our commitments as outlined below.

We are committed to:

- ◆ **Ensure** compliance with applicable legal requirements, regulations and standards
- ◆ **Assess** and eliminate or minimise negative environmental impacts
- ◆ **Train** our employees in preventative and remedial environmental practices
- ◆ **Proactively** explore opportunities to improve the efficiencies of our equipment and operating practices
- ◆ **Evaluate** our operations and controls, setting targets that drive improvements in the environmental performance of the business
- ◆ **Involve** suppliers and contractors in the pursuit of best environmental practice
- ◆ **Investigate** all environmental incidents and apply relevant learnings
- ◆ **Share** knowledge through open communications on environmental improvements and promote a learning culture
- ◆ **Deliver** efficient business solutions that meet the needs of our customers

THE SUCCESS OF THIS POLICY REQUIRES THE FULL INVOLVEMENT AND COMMITMENT OF EVERYONE WORKING ON BEHALF OF AGGREKO

The Group QHSE Director has responsibility for ensuring that the business maintains a comprehensive management system that is routinely audited and provides assurance to the Executive and the Board. Our Health and Safety performance is reviewed regularly by the Aggreko Executive and the Board.



Blair Illingworth
Group Chief Executive Officer
April 2022



3.0 ACKNOWLEDGMENT OF THE TRADITIONAL OWNERS

Aggreko acknowledges the Gumatj, Rirratjingu and Galpu Traditional Owners of the land and their elders past and present.

We respect the 2011 Gove Traditional Owners Agreement signed by the Gumatj, Rirratjingu and Galpu Traditional Owners, the Northern Land Council and Rio Tinto.

The Agreement formally acknowledges the Traditional Owners and lays the foundation for intergenerational benefits and sustainable economic, cultural, social, and environmental outcomes for the signatory Traditional Owner groups and communities.

4.0 SCOPE OF WORKS

4.1 AGGREKO SCOPE OF WORKS

Install (1) 5.25 (Nominal) MWp Solar Farm electricity generation facility at the Solar Farm Site 2.

4.2 RIO TINTO SCOPE OF WORKS

All site civil construction site works, clearing and protection of vegetations/environment of the site and surrounding area, the establishment of the Aggreko site perimeter fencing will also be undertaken by Rio Tinto.

4.3 FIGURE: SOLAR FARM 2 SITE LOCATION



Site Compound [Blue Box]

Site Office, Canteen, Amenities, First Aid

Waste & Recycling [Green Box]

Hard Rubbish, Timber, Plastic, Cardboard, Metal

Spill Kits [Yellow Circle]

Fire Fighting Equipment [Red Circle]

GOVE PLOT 1 POINT OF CONNECTION TO RTA'S DISTRIBUTION NETWORK

Lay Down Area 1

Lay Down Area 2

DCB1-1A/1B, DCB2-1A/1B, DCB3-1A/1B, DCB1-1B/1B, DCB2-1B/1B, DCB3-1B/1B, DCB1-2A/2B, DCB2-2A/2B, DCB3-2A/2B, DCB1-2B/2B, DCB2-2B/2B, DCB3-2B/2B

Entrance / Exit Gate
Site Signage

28121
37059
49130
29900



5.0 DEFINITIONS

5.1 TABLE 1: ABBREVIATIONS

Word/Acronym	Meaning
EHS	Environmental Health and Safety
SDS	Safety Data Sheet
WHS	Work Health and Safety
HV	High Voltage
JSERA	Job Safety and Environmental Risk Analysis
PPE	Personal Protective Equipment
QHSE	Quality, Health, Safety and Environment
RA	Risk Assessment
SWMS	Safe Work Method Statement
ERP	Emergency Response Plan
RTA	Rio Tinto Aluminium
SEP	Site Emergency Procedure
AS/NZS	Australian & New Zealand Standards
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ISO	International Organisation for Standardisation
NT	Northern Territory
EPBC	Environment Protection and Biodiversity Conservation Act 1999

5.2 TABLE 2: LIST OF TERMS AND DEFINITIONS

Term	Definition
Environmental Impact	The harm that has occurred, or has the potential to happen, to the surroundings in which we operate, including air, water, land, natural resources, flora, and fauna.
Incident	A single event, continuous or repetitive series of events that results in, or could have resulted in, one or more of the following impacts: - Occupational injury or illness. - Damage to physical assets, the environment, process, product, or reputation. - Disruption to a community. - Exposure to legal liability. - Security threat.
Non-Compliance	A form of incident where a business or site experiences a failure to meet external requirements such as legal or other requirements.
Non-Conformance	A type of incident where a business or site experiences a failure to meet internal requirements established by a Group following its standard procedures.
Suitably Qualified Professional	A person who is a Registered Professional and has demonstrated competency and relevant experience.
Area	An area or process building within the Gove Operations.
Contamination	About land, water, or a site, having a substance present in or on the ground, water or site at above background concentrations that present, or has the potential to present, a risk of harm to human health, the environment, or any environmental value.
Fresh Water	Water that is naturally occurring and contains low concentrations of dissolved salts and other total dissolved solids.
Gove Operations	Rio Tinto Gove Operations (including mine, refinery, port, RDA, refinery etc.).
Remediation	Work done to remove, contain, or otherwise mitigate contamination in soil or water to reduce risk to an acceptable level.
Surface Water	Water flows over ground surfaces and in natural streams and drains as a direct result of rainfall over a catchment.



6.0 REGULATORY AND CORPORATE FRAMEWORK

6.1 LEGISLATION, REGULATIONS AND STANDARDS

Aggreko will adhere, but not limited, to the below Northern Territory & Federal Legislated & Regulations, 'Australian Standards' and 'Good Practices Publications' listed.

6.1.1. TABLE 3: NORTHERN TERRITORY LEGISLATION

Northern Territory Legislation	
▪ Aboriginal Land Act 1978 ▪ Biological Control Act 2016 ▪ Bushfires Management Act 2016 ▪ Building Act 1993 ▪ Control of Roads Act 1953 ▪ Dangerous Goods Act 1998 ▪ Environmental Assessment Act 1982 ▪ Environmental Offences and Penalties Act 1996 ▪ Environment Protection Act 2019 ▪ Fire and Emergency Act 1996 ▪ Heritage Act 2011 ▪ National Environment Protection Council (Northern Territory) Act 1994	▪ Northern Territory Aboriginal Sacred Sites Act 1989 ▪ Mining Management Act 2001 ▪ Mineral Titles Act 2010 ▪ Plant Health Act 2008 ▪ Soil Conservation and Land Utilisation Act 1969 ▪ Territory Parks and Wildlife Conservation Act 1976 ▪ Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010 ▪ Waste Management and Pollution Control Act 1998 ▪ Water Act 1992 ▪ Water Legislation Amendment Act 2018 ▪ Weeds Management Act 2001 ▪ Work Health and Safety (National Uniform Legislation) Act 2011

6.1.2. TABLE 4: NORTHERN TERRITORY REGULATIONS

Northern Territory Regulations	
▪ Building Regulations ▪ Dangerous Goods Regulations ▪ Environmental Offences and Penalties Regulations ▪ Fire and Emergency Regulations ▪ Heritage Regulations ▪ Territory Parks and Wildlife Conservation By-Laws ▪ Weeds Management Regulations	▪ Territory Parks and Wildlife Conservation Regulations ▪ Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations ▪ Waste Management and Pollution Control (Administration) Regulations ▪ Water Regulations ▪ Work Health and Safety (National Uniform Legislation) Regulations



6.1.3. TABLE 5: FEDERAL LEGISLATION AND REGULATIONS

Australia Federal Legislation	Australia Federal Regulations
- Aboriginal and Torres Strait Islander Act 2005 - Aboriginal and Torres Strait Islander Heritage Protection Act 1984 - Aboriginal Land Rights (Northern Territory) Act 1976 - Australian Heritage Council Act 2003 - Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) - Native Title Act 1993 - National Environment Protection Council Act 1994	- Aboriginal and Torres Strait Islander Heritage Protection Regulations - Aboriginal Land Rights (Northern Territory) (Land Description) Regulations - Aboriginal Land Rights (Northern Territory) Regulations - Environment Protection and Biodiversity Conservation Regulations

6.1.4. TABLE 6: AUSTRALIAN STANDARDS AND OTHER PUBLICATIONS

Australian Standards	
- AS/NZS/ISO 14001 Environmental management systems - Requirements with guidance for use - AS 490 - 2009 Protection of trees on development sites	AS 2436 Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites
Other Publications	
- International Erosion Control Association (IECA) Australasia Best Practice Erosion and Sediment Control - Northern Territory Natural Resource Management Plan – Top End Region 2021-2025 (Territory Natural Resource Management, 2021) - ISO 19011:2018 Guidelines for auditing management systems - Leading Practice Sustainable Development Program for the Mining Industry (Australian Government, 2016)	- Northern Territory Land Clearing Guidelines (Northern Territory Government, 2021) - Northern Territory Noise Management Framework Guideline (NT EPA, 2018) - Environmental Noise Management Manual (RTA, 2001) - Declared weeds of the Northern Territory (NT Government, 2019) - Prevent Pollution from Building Sites (NT EPA, 2015)

7.0 AGGREKO POLICY AND STANDARDS

All employees, contractors and visitors at the project site will be advised of the protection of the environment and the effect our operations could have upon the environment. Our site QUALITY, HEALTH, SAFETY and ENVIRONMENT POLICY is set out as follows:

All site engaged employees and contractors will attend basic safety and environmental training prior to commencement of the project, by way of participating in:

- Any applicable client or principal contractor's inductions as required.
- Aggreko HSEMS procedures encompassing training, and local Health, Safety and Environmental Regulations.

OHS OP 004



8.0 CULTURAL HERITAGE

Although Rio Tinto will have completed the site civil works and site establishment, Aggreko will be required to bore post holes for the establishment of the Solar Panels 'Post' to attach the solar panel structure. Due to this activity, all Aggreko site personnel must be aware of cultural heritage obligations when working in the vicinity of a designated area of cultural or heritage significance or in the event of unearthing cultural or heritage significant artefacts.

8.1 CULTURAL HERITAGE ACTS AND REGULATIONS

There are several Commonwealth and Northern Territory statutory regulations that are relevant to the protection management of indigenous and historic heritage in the Northern Territory.

8.1.1. TABLE 8: CULTURAL HERITAGE ACTS AND REGULATIONS

Cultural Heritage Acts & Regulations	
The Heritage Act 2011	Provides protection for Indigenous and non-Indigenous archaeological places and objects in the Northern Territory, along with other places, classes of places, or objects considered to be of heritage significance by the Heritage Council.
Northern Territory Aboriginal Sacred Sites Act 1989	Provides protection for sacred sites in the Northern Territory and establishes the Aboriginal Areas Protection Authority (AAPA), which is responsible for issuing Authority Certificates that set out conditions for carrying out proposed works when using land in the vicinity of sacred sites.
Native Title Act 1993 (Commonwealth)	Provides for the recognition of native title rights and interests and provides for the protection and engagement.
Aboriginal Land Rights (Northern Territory) Act 1976 (Commonwealth)	Establishes the role of Aboriginal land councils in the Northern Territory and contains provisions to protect sacred sites.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC)	Provides for the protection of the environment, especially matters of national environmental significance, conserve Australia's biodiversity, protect biodiversity internationally by controlling the international movement of wildlife.

8.2 SOLAR FARM 2 - CULTURAL HERITAGE MANAGEMENT

Rio Tinto Gove is the primary land lease holder and have conducted a Cultural Heritage Management Plan. Aggreko will be integrating their procedural policy with Rio Tinto's, for consistency and transparency, to avoid disturbing and damaging 'Aboriginal or Cultural Heritage Artefacts' or 'Sacred Sites' and to minimise the impacts or disruption to activities of the Indigenous stakeholders. This includes such actions as:

- Site Cultural Heritage awareness and obligations to be incorporated with the site inductions, summarising the potential impacts on identified heritage sites/items arising in and the surrounding work area.
- Before any land disturbance, Aggreko will engage with Rio Tinto Gove Operations to check for any cultural, heritage and community impacts for the work site and to the immediate surrounding area.
- Rio Tinto Gove Operations is to issue Cultural Heritage AAPA Authority Certificate permit to Aggreko before the commencement of any activities (s).

Aggreko supervisor is to monitor the drilling/boring. In the event cultural or heritage significant artefacts are discovered, the drilling/boring activity is to immediately cease. Aggreko senior site management, Aggreko QHSE project allocated specialist and the Rio Tinto Gove Operations delegated will be notified of the findings. Operations will not recommence until approval is granted from Rio Tinto Operations with a new AAPA Authority Certificate Permit being issued.



9.0 ENVIRONMENTAL MANAGEMENT

The objective of the plan is to mitigate, eliminate and/or minimise the impact of the Gove Solar Farm 2 installation works at site, on the environment and the responsibilities including to Aggreko personnel, client personnel, contractors and the public.

Possible environmental impacts may include:

- Waste management impact.
- Spills and pollution (oil or chemical, exhaust fumes).
- Chemical management impact.
- Air pollution – (noise, dust, exhaust emissions).

Based on preliminary site-specific geotechnical investigations and low gradient topography, there is a low risk of erosion and sediment loss in the project area.

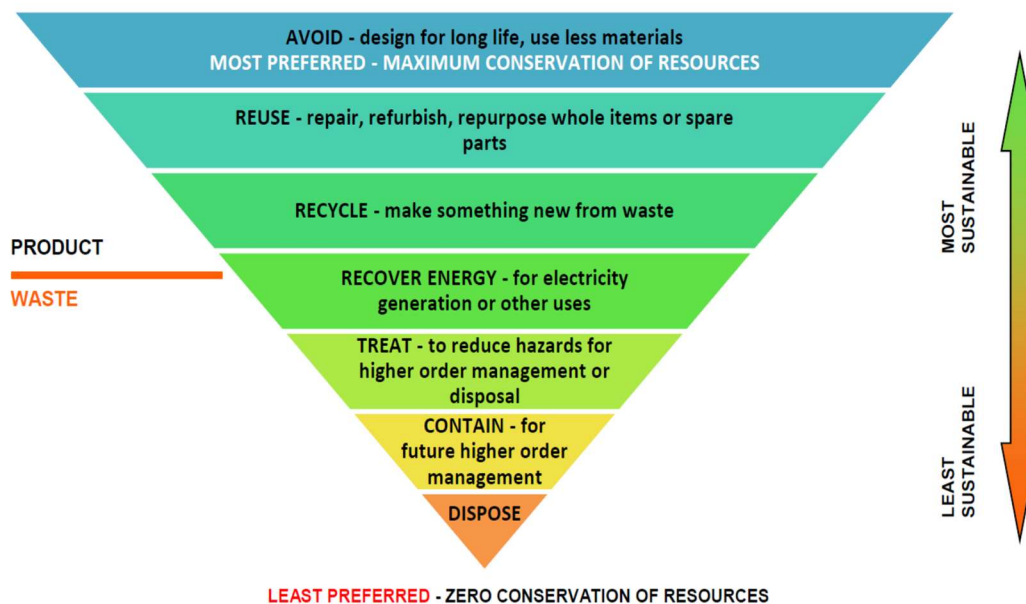
Site environmental risk assessment is to be provided by Aggreko in consultation with any interested party in accordance with ISO 31000.

Where the environmental hazards have been identified, Aggreko will perform a risk analysis of the effects and consequences of the hazards and ensure adequate controls are put in place to prevent/minimise any impact to the environment.

9.1 WASTE MANAGEMENT

By mitigate, eliminate and/or minimise waste at site it will also have a secondary objective, such as reducing costs for new materials and for treatment and disposal of wastes, improving environmental performance and compliance, and improving Aggreko's market position as a leader in provision of sustainable energy and temperature control solutions.

Aggreko has adopted the following hierarchy of waste management options and requires all employees and contractors to pledge to it:



The waste management hierarchy is in order of preference. All Aggreko wastes should be managed in accordance with the hierarchy. Waste avoidance is the most preferred option and disposal is the least. Recycling of waste will be the primary objective where possible.

Waste bins for various types of waste will be identified and placed at appropriate locations as per client and local regulations. Waste bins must not be overflowing and those responsible for waste disposal must be contacted in a timely manner.



Where a known substance requires specific disposal needs, the manufacturer is to be contracted for this process where possible. Often, manufacturers accept the return of unused/old chemicals. If the material is unknown or will not be accepted by the manufacturer, the local council or the waste management branch (or equivalent), then the appropriate Government department is to be contacted for disposal guidance.

Further guidance and potential support should be sought from the specific site contact. Site practice should be adopted where necessary.

9.2 SPILLS AND POLLUTION PREVENTION

Aggreko will initiate all measures in a reasonably practicable manner to prevent any spill. Fuel tanks are to be double skinned prior to transportation. Leftover fuel from the fuel tanks must be emptied as much as the pumps can, to prevent any spill in transit. Refueling operations must not be carried out unattended to prevent any overflow. All equipment (i.e. hoses, gaskets etc.) must be inspected regularly to locate any damage/deterioration which can lead to spills.

Generator containers are protectively banded to prevent any overflow of accidental small spills. Spill kits must be stored at appropriate locations and all service vehicles must carry spill kits. All fuel tanks, drums, other liquids (other than rainwater or town drinking water supply) must be:

- stored in banded areas, on drip trays.
- adequate spill kits to clean up any spill.
- handled with prescribed PPE must be worn while cleaning spills.
- the spill must be contained by blocking any drain and building a barrier with socks or other device (s).
- contaminated material (i.e. soil, pads, etc.) should be disposed of properly, as stated by local & statutory regulations.

All spills more than 5 litres must be reported to the site Supervisor and project allocated QHSE Specialist. If spills enter any stormwater drain/local creek, the project allocated QHSE Specialist will liaise with Rio Tinto Gove to ensure local legislative and regulatory reporting requirements are met.

9.3 CHEMICAL MANAGEMENT (STORAGE AND HANDLING)

Storage and handling of chemicals shall be in accordance with the following:

- SDS requirements.
- The relevant SDS risk assessment.
- HSE DWG 001 Storage of Dangerous Goods Chart.
- Relevant statutory requirements to quantities, segregation and warning signs.
- Ensure all containers are correctly labelled.
- Ensure all containers are in good condition and are not dented, rusty or show other signs of wear (e.g. sun exposure).
- Ensure that any bulk storage facilities, fuel tanks, IBCs, valves, taps, hoses, pipes and any other structure or infrastructure designed to contain chemicals are regularly inspected (monthly) and non-destructively tested (2 yearly) for signs of wear, damage or leaks.
- Ensure chemicals and their containers do not become unstable, decompose or change.
- Ensure the risk to other Dangerous Goods is eliminated and non-compatible goods are stored separately such that a loss of containment, or any other interaction, will not cause a serious incident.
- Ensure there are no sources of ignition within a hazardous area.
- Ensure there are no emission sources from the hazardous area.
- Ensure that where dangerous goods are stored provision is made for containment of spills or leaks.
- Ensure that all cylinders are secured.
- Any area intended to contain spills or leaks is not shared with any other chemicals which are not compatible.

Project personnel shall be competent to respond to emergencies which may arise during the loading, unloading, storage, decanting or issue of hazardous substances.

Vehicle unloading/loading shall be made in supervised areas, i.e. the goods shall not be left unattended for any length of time.

Deliveries of non-conforming hazardous substances, i.e. not as ordered or unlisted products, shall be quarantined until returned to the supplier or cleared by the Project Lead/Operations Manager for use.

Any damaged packages shall be repacked into sound containers and returned to the supplier or their disposal arranged.



All packages and containers shall be in good condition and not damaged or leaking.

Bulk products are only to be decanted into suitable containers and are to be appropriately labelled.

Storage area bunding and drainage shall be adequate to contain any spillage.

9.4 QUARANTINE MANAGEMENT

Quarantine is managed on a case-by-case basis and is dependent on the material or equipment, along with any site-specific requirements.

9.5 AIR POLLUTION

Prior to commencing Aggreko site operational activities, the Aggreko Project lead/Operations Manager shall ensure that appropriate risk assessments have been undertaken.

9.5.1. POSSIBLE SOLAR FARM 2 AIR POLLUTION

Possible Solar Farm 2 Air Pollution adverse impacts upon air quality shall consider the following, if applicable:

- Chemical
- Vehicle/generator (type and fuel source)
- Pollution control equipment
- Servicing
- Inspection, test and maintenance records
- Climate
- Dust

The Operations Manager shall determine the necessary risk management control measures to be implemented to minimise the impact on air quality.

Risk control measures that may be applied shall include, but are not limited to:

- Alternative products to improve efficiency and reduce contamination severity.
- Pollution control equipment to reduce environmental discharges.
- Covering of work areas - to reduce effects from the elements.
- Waste disposal – covering waste storage receptacles, effective containment and prompt removal to prevent discharge of odours and toxic compounds to the air environment.
- Dust suppression.

9.5.2. ENGINE EXHAUST EMISSIONS MANAGEMENT

Engine exhaust emissions from plants and equipment and vehicles, particularly from diesel engines are a significant potential source of air pollution arising from Aggreko's activities, delivering/unloading and general work activities onsite.

The management measures and mitigation strategies that are implemented to minimise the potential impacts associated with air quality management include but are not limited to the following:

- The latest available technology will be considered for any new equipment and plant purchased to minimise energy consumption and avoid air pollution.
- Unnecessary vehicle movements will be eliminated by carpooling where practicable.

9.5.3. FUGITIVE EMISSIONS MANAGEMENT

To mitigate fugitive emission (chemicals/oils/fuels/waste) caused by evaporation and other losses into the air environment, the following will be implemented:

- Vents to be installed with pollution control devices.
- Activated carbon filters installed where required.
- Controlled storage and prompt disposal of waste to prevent discharge of offensive odours or noxious pollutants to the local environment and statutory requirements.



9.5.4. DUST CONTROL MANAGEMENT

Dust may potentially be generated during construction activities, and potentially as a result of Aggreko activities undertaken on unpaved areas of other permanent and non-permanent Aggreko locations.

- Where necessary, dust suppression measures shall be implemented, which may include, for example:
 - Installation of paving or another suitable hardstand.
 - Use of water sprays.
 - Limiting work activities that may generate dust to controlled areas, e.g. cutting, welding, sand blasting, sanding, grinding, spray painting.

Under no circumstances will waste oil or other similar materials to be used as a dust suppressant, either on its own or as an additive to water sprays.

The control methods required to mitigate the potential adverse effects of activities shall be included in the site's risk register.

Where required, the Aggreko management and employees will:

- Assess Aggreko sites to establish whether air quality is likely to be adversely affected by Aggreko's activities.
- Implement and maintain a management plan to maintain and where possible, enhance air quality and prevent adverse impacts upon the local environment.

9.6 MAINTENANCE

To mitigate the possibility of environmental incident by plant, equipment or vehicles at site, work equipment utilised by Aggreko shall be suitable for its intended purpose, with risks identified and controlled.

Aggreko shall ensure that all plant, including common plant provided by Aggreko for all works is selected, installed, commissioned, maintained, serviced, decommissioned or dismantled in accordance with:

- Relevant WHS legislation (and relevant other guidance).
- Aggreko Safe Working Instructions (Where specifically developed).
- Supplier or Manufacturer instructions.
- Australian and/or International Standards.
- Other relevant documentation in consultation with Aggreko Manufacturing and Engineering teams.
- Aggreko Operational guidance and directives.

Aggreko shall ensure that all persons involved in the commissioning, installation, use, operation, maintenance, repair and testing, along with the de-commissioning, dismantling and disposal, of Aggreko owned plant are provided with all available information concerning health and safety about the item of plant.

Specific work equipment manuals and safe working instructions (where developed) must be available to ensure the health & safety and to minimise the potential of environmental impact.

These manuals and safe working instructions will assist in ensuring the integrity of each piece of plant or equipment is maintained throughout its' functional operability.

Procured or hired work equipment shall be:

- Maintained and inspected in accordance with manufacturer recommendations or as directed by the delegated authority of the Aggreko Operations Council and in accordance with local legal requirements and any other requirements associated with this Standard.
- Selected with consideration given to its potential environmental impacts.
- Have safeguards in place to protect against noise, vibration, fumes, moving parts, electricity, pressurised systems etc.
- Warning signs and Human Machine Interface (HMI) controls shall be clearly identified/displayed and be understood by all users irrespective of local language.

All plant and equipment will have Maintenance Schedules developed.



9.7 TERRESTRIAL FLORA, FAUNA AND NATIVE HABITAT DISTURBANCE

Rio Tinto has completed all the civil works and has provided Aggreko with a cleared, accessible site with no vegetation of any considerable significance, but there may be the possibility of regeneration habitat for threatened flora and fauna species, whereby extenuation measures will be implemented to reduce the potential weed introduction and the protection of fauna and habitat.

9.7.1. MANAGEMENT OF TERRESTRIAL FLORA, FAUNA AND NATIVE HABITAT DISTURBANCE

The following strategies will be implemented to manage the flora, fauna and the native habitat within the Solar Farm Site 2 compound and be included in the site induction:

- Awareness and identification of fauna such as snakes, other reptiles, native mammals and marsupials where they can be trapped in materials on site.
- All site personnel to be aware of the endangered and protected species of the Black Footed Tree Rat.
- Controls on activities or facilities that might disturb native fauna feeding and reproduction cycles.
- If trenches are to be left open overnight, in addition to barricading, provide one end of the trenches battered down as a ramp to enable fauna to escape.
- Any bores to be left open are to be covered, which will prevent fauna from falling into the hole (s).
- It is prohibited to destroy, take, kill, or unnecessarily disturb any animal (s).
- The requirement of Rio Tinto 'Vegetation Clearing Approval' permits.
- If regrowth vegetation clearing is required, it should occur outside the breeding season of local birds, ideally between December and March.
- Vegetation to be cleared sequentially to encourage fauna to move out of the development area and into adjacent retained vegetation areas.
- Any injury or death of fauna within the Solar Farm site Area shall be reported. Known causes of death of fauna should also be noted.
- Any injury or death of rare, endangered, or vulnerable fauna shall be immediately reported.
- If any endangered or threatened species are found within the clearing or construction zone this also needs to be reported.

9.8 PEST AND FERAL SPECIES

Aggreko will ensure the activities within the Solar farm Site 2 compound do not encourage and will minimise the introduction or breeding of animal pests which can destroy the surrounding rehabilitation vegetation. The major pest animals known in the Gove region include Yellow Crazy Ants, Water Buffalo, Feral Pig, Feral Cat, Cane Toads and other pest species such as mosquitos and sandflies.

9.8.1. PEST AND FERAL SPECIES MANAGEMENT STRATEGIES

The management strategies include reducing or eliminating the source of spread or attraction. Typical spreading of pests, including weeds, can be introduced on to the Solar Farm Site 2 site by transfer of plant and equipment, vehicles from other sites, incorrect disposal of foods waste, waste-retaining containers which attract fauna and pest species.

The following management strategies will be implemented:

- Sightings of feral or pest species should be reported to the Contractor Supervisor documented in the feral and pest register at site and required response for rehabilitation of the area.
- Waste management and housekeeping to minimise attraction of animals to food waste around office and laydown areas.

Mosquitoes and Sandflies

Prevention and mitigation of the potential mosquito breeding sites:

- Establish drain spools to disperse standing water.
- The site shall be free of water-holding receptacles, e.g. tyres, stockpiled plastic sheeting, wheel ruts.



- Report primary mosquito and larvae infestations to enable the engagement of a pest control contractor.
- Ensure the Solar Farm site area floors do not intercept natural groundwater tables.

Yellow Crazy Ants

- Train site personnel to be able to identify the characteristics and behaviour of 'Yellow Crazy Ants'.
- Immediately report any sighting of Yellow Crazy Ants Nest to the Contractor Supervisor.
- If 'Yellow Crazy Ant' colonies is encountered:
 - all site activities (machinery and vehicle movement) will be halted, and the area quarantined with appropriate flags,
 - Contractor Supervisor must be notified and they will notify the Rio Tinto Gove Operations,
 - All vehicles and machinery will be inspected and cleaned as necessary before being allowed to leave the site,
 - Rio Tinto Gove Operations will provide and implement an appropriate eradication treatment.

Aggreko will ensure to advise Rio Tinto Gove Operations is advised of any pest and feral species incursions.

10.0 LEADERSHIP VISIBILITY AND ACCOUNTABILITY

10.1 MANAGING DIRECTOR

- Must commit to the development and implementation of HSE and its continual effectiveness.
- Must ensure HSE objectives are developed within their level of operations and employees are performing to the achievement of these objectives.
- Understand and apply Aggreko's QHSE policies and standards.
- Ensure the Coordination and Cooperation between Aggreko and any other concerned party.
- Approve Aggreko's HSE and associated documentation, local policies and procedures, and any amendments thereof.
- Ensure that the projects structure and resources are appropriate to manage QHSE.
- Ensure that appropriate communication processes are established, and that communication takes place regarding the effectiveness of HSE and importance of meeting customer as well as statutory and regulatory requirements.
- Ensure all managers and staff fully understand and comply with the standards.
- Ensure that Aggreko AusPac's disciplinary procedure is enforced with regards to breaches of the QHSE policies and standards and follows Aggreko's Fair and Just Culture Flowchart.

10.2 QHSE MANAGER

- Understand and apply the Global HSE Policies and Quality Policy of the Company.
- Ensure the coordination and cooperation between Aggreko AusPac and any other concerned party.
- Ensure that the Aggreko AusPac structure and resources are appropriate in order to manage QHSE and implement HSE.
- Advise and assist the QHSE Team in establishing and measuring annual objectives, targets and programs for attainment.
- Ensure that Aggreko AusPac's disciplinary procedure is enforced with regards to breaches of the QHSE policies and standards and follows Aggreko's Fair and Just Culture Flowchart.
- Provide resources such as material, training, etc. to establish, implement, maintain and improve HSE.
- QHSE Manager has been appointed as Management Representative (MR) for HSE.
- Ensure that HSE requirements are established, implemented and maintained in accordance with ISO 14001:2015, ISO 45001 and ISO 9001:2015 Quality Management System and other relevant business operating guidelines.
- Report on the performance of HSE to the management team as part of management review and as a basis for improvement.
- Advise on levels of QHSE training, supervision and instruction and be active in securing high standards in these areas.
- Maintain and update the legal and other requirements relevant to HSE.



10.3 PROJECT MANAGER

- Assist in the development of the Environmental Plan.
- Ensure the Aggreko Project Leads/Operations have clear concise knowledge and requirements of the Environmental Plan.
- Ensure contractors have implemented and understand Aggreko Environmental Plan.
- Continuous review of Environmental Plan and input the Project Lead/Operations.
- Communicate and document Environmental Plan with RTA Gove HSE and Operations team.

10.4 PROJECT LEAD/OPERATIONS MANAGER

The Aggreko Project Lead/Operations Manager has the responsibility for operations and Health, Safety & Environment including:

- Ensure this 'Safety Management & Environmental Plan' is implemented and adhered to.
- Provide safeguards and take safety measures prescribed under relevant state legislation that may be applicable.
- The discharge of Workplace Health & Safety and Environmental obligations including self-employed persons.
- Ensure that activities and materials used on the project are safe and comply with the environmental policies without risk of disease or injury to persons at the workplace.
- Encourage and facilitate worker involvement through workplace consultative arrangements (e.g. Toolbox meetings).
- Carry out management Safety/Environmental Audits, reporting risks and positive behaviours through the Aggreko HSE App.
- Direct workers to "Stop Work" until they agree to comply with their obligation.
- Notify the Aggreko person responsible for the site (e.g. manager) in the event of breach of the environment or any injury or to Aggreko personnel or Aggreko's contractors' personnel. Refer OHS MP 007 Incident Reporting and Investigation Procedure.
- Provide assistance where necessary to ensure that accidents/incidents/environmental breaches are investigated both promptly and to the required standard to allow corrective action to be initiated if deemed necessary.
- Facilitate risk assessment process for any hazard identified as requiring assessment. Maintain copy of all assessments conducted.
- Report all serious/potentially serious accidents/incidents/environmental breaches to Aggreko QHSE Manager.
- Maintain a manifest of hazardous substances to be used on site. Safety Data Sheets must also be kept.
- Assist all personnel with any/all inspections/audits or queries. Maintain records of such instances.
- An adequate supply of appropriate PPE is kept on the project site for the use of employees, contractors and visitors. This is to be provided by Aggreko, contractor(s) or the site, in accordance with the agreement documentation.
- Where prescribed by supervision, sign or other means, employees must adhere/comply to and wear the PPE and protect the environment.
- Active/response/investigate/document to safety/environmental incidents/emergency.
- Provide continuous feedback, review, revision and documentation of the CEMP.

10.5 QHSE SPECIALIST

- Carry out risk assessments and/or environmental aspect/impact assessments.
- Conduct HSE/QHSE inspections and/or audits and issue reports on findings.
- Follow up in effective closure of audit findings.
- Carry out investigations into accidents, incidents, near misses and make recommendations as to how these may be prevented.
- Advise on current legal requirements relating to HSE/QHSE and propose changes to policies and procedures in response to new legislation or amendments to current legislation.

10.6 SUPERVISORS

All personnel are directly responsible for their safety and to assist in this matter, all supervisors will:

- Become familiar with this 'Safety Management & Environmental Plan' and assist with its implementation, control and review.
- Ensure appropriate safe egress to the workplace and manage the following:
 - Supervise the workers/contractor/s site induction process and implementation of workers/Contractor safety systems.



- Deliver daily prestart briefings and toolbox talks.
- Tasks for the shift (any special precautions and JSERA/SWMS/Environmental).
- Investigate and resolve any concerns from personnel or client.
- Ensure all personnel are wearing/using PPE correctly and compliant with HSE requirements.
- Conduct safety/environmental Audit walks for compliance.
- The prompt notification, recording and investigation of incidents/accidents.
- Maintain and encourage safe work and environmental practices and conditions for all personnel.
- Active/response/investigate/document to safety/environmental incidents/emergency.

10.7 WORKERS

All workers have an obligation:

- To comply with instructions given for workplace health and safety/environment by the employer, inspectors or other officials.
- To use and maintain personal protective equipment and adhere to ESH policies and procedures.
- Not to intentionally interfere (willfully or recklessly) or misuse equipment and policy for Workplace Health & Safety and environment.
- Not to risk the safety of others or the environment.
- Not to injure themselves or damage the environment willfully.
- To assist at the scene of any incident and to report incidents as soon as possible.
- To report/rectify any unsafe HSE practice/condition, to the Supervisor, Project Lead/ Operations Manager.
- Not to suppress any report or information or make a false statement on any matter concerning HSE.
- Not to enter or remain at the work site if under the influence of a drug, alcohol or suffering from a physical or mental condition or other medical/injury condition that may possibly prevent them from performing their duties in a safe manner or damage the environment.
- Not knowingly proceeding to unsafe workplace/environment until the site has been deemed safe.
- Throughout the project, all personnel are to continually assess the hazards and risks involved in work procedures to the environment and to ensure the correct use of appropriate PPE.

10.8 SUB-CONTRACTORS

Sub-Contractors will be employed in specialty areas to work on the project from time to time.

Sub-Contractors and their employees will be supervised in the same way and have the same responsibilities as an Aggreko employee (worker). All Sub-Contractors will undergo the required induction prior to starting work and will:

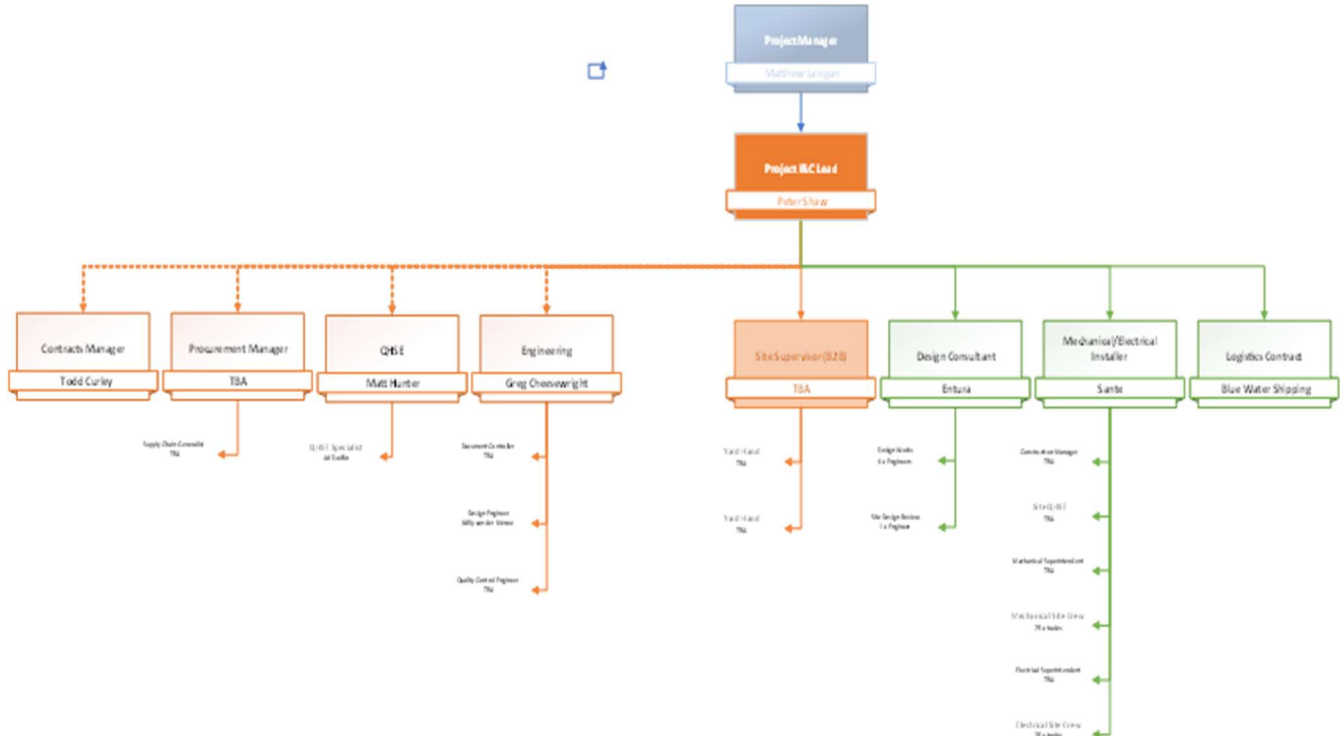
- Sub-Contractors will be under the direct control of the Supervisor/Project lead/Operations Manager.
- Sub-Contractors will comply with the provisions of this 'Safety Management & Environmental Plan'.

Sub-Contractors' supervisor will lead their team (workers) and be responsible for the following:

- Implement and adhere to the site Aggreko OHS and CEMP.
- Ensure the contractor workers have the necessary skills and competence to undertake there given task and understand the environmental requirements relevant to their scope of work and area.
- Ensure the necessary resources and processes are in place to implement environmental controls.
- Participate/conduct and document and action regular/daily safety and environmental site Audit walks.
- Communicate and document to the delegated Aggreko representative:
 - Environmental requirements, issues, obligations specific to the site to all project personnel and subcontractors.
 - Non-compliances and non-conformances are identified, investigated, recorded and reported to Aggreko representative.
- Notify/coordinate/participate with safety/environmental incidents/emergency and allocate required resources to mitigate the incident/emergency.
- Authority to 'Stop' and report any activity that has resulted, or has the potential to result, in an environmental incident.
- Actively participate in reviews of the CEMP.



10.9 SOLAR FARM 2 – AGGREKO PROJECT TEAM ORGANISATIONAL CHART



10.10 SOLAR FARM 2 – ENVIRONMENTAL RESPONSIBILITY MATRIX

The Solar Farm 2 – Environmental Responsibility Matrix details the primary onsite environmental possible impacts and who is responsible for the installation of the solar farm.

The mining lease is held by Rio Tinto and it is the accountable entity under the mining legislation. Aggreko, Rio Tinto's appointed specialist contractor will be responsible for the HSE management of the solar farm site'.

10.10.1. TABLE 7: SOLAR FARM 2 – ENVIRONMENTAL RESPONSIBILITY MATRIX

Onsite Environmental	Aggreko	Rio Tinto HSE Department	Rio Tinto Site Operations
Spill Prevention and Response	R	C	I
Air Pollution Management	R	C	I
Pest Management	R	C	I
Waste Management	R	C	I
Cultural Heritage	R	C	I
Emergency Response & Disaster Recovery	R	C	I

Legend: R = Responsible; A = Accountable; C = Consulted; I = Informed



11.0 SAFETY AND ENVIRONMENTAL TRAINING AND COMPETENCY

Aggreko will ensure that all Aggreko personnel/contractors/visitors complete all necessary Safety & Environmental inductions (general inductions and site specific) prior to commencing work at site, as directed by the customer or the customer's representative, if available.

During the inductions, the inductee (s) will be informed of the site EMP, environmentally sensitive areas, identified cultural sites of significance, Sacred Sites or Restricted Works Areas (RWAs) and environmental responsibilities, including mandatory site environmental approvals, licenses and permits.

11.1 INDUCTION TRAINING

A training matrix will be maintained by the Aggreko HR team and a copy of the training matrix will be provided to Rio Tinto on request.

Without pre-empting the content of RTA Gove Limited inductions, the Safety & Environmental inductions should address as applicable, the following subject matter and any other detail pertinent to the project:

Health, Safety and Environmental Policy	Hazardous substances
Project rules and regulations	Personal protective equipment
Safety obligations	Risk management process and JSA
Authorisation	Drugs & alcohol awareness
Workplace consultative arrangements	Environmental protection
Site emergency procedures	Smoking policy
Incident/reporting and investigation	Contractor management
HV operations	

Not all aspects may be pertinent to the site, however if these components have not been addressed and relevant guidance cannot be obtained from Aggreko's procedures then further enquiry must be made prior to continuation beyond the point of enquiry.

11.2 SITE SPECIFIC INDUCTIONS

An Aggreko safety and environmental induction to the workplace will be completed by all personnel, workers, contractors and visitors. This will be done by the site supervisor(s), or a nominated person and inductions recorded.

11.2.1. GOVE INDUCTION

Due to the various levels of site access requirements, dependent on the nature of the visit or work being carried out, all personnel attending the RTA Gove Solar Farm site 2 are to liaise with their site sponsor and ensure the correct level of Safety & Environmental induction is undertaken.

11.3 COMPETENCY AND PERMITS

No person shall commence work on the project unless the Project Lead/Operations Manager/Supervisor has verified that the person is trained to perform the work and the relevant Approval Permits are active.

All employees will be provided with information, instruction, training and supervision as are necessary to enable them to perform their task/work in a safe manner without risk to their health and safety or to the environment. Trainee worker(s) shall always work under the direct supervision and instruction of the holder of the relevant Certificate of Competency.

No personnel (employee/contractor) will be permitted to undertake or commence work/task on the project unless:



- they have attained the required Certificate of Competency, or equivalent or relevant training and deemed competent,
- they been authorised in writing by the Aggreko Project Lead/Operations Manager,
- they have been approved by the Aggreko Project Lead/Operations Manager/Supervisor and have attained the appropriate accreditation (high-risk) and licenses,
- No person shall undertake any electrical work without holding a current electrical license or mutually recognised license.

12.0 EMERGENCY PREPAREDNESS AND RESPONSE

12.1 INCIDENT RESPONSE

Accidents, incidents and near misses shall be recorded on the global risk and incident reporting system and investigated. The Operations Manager shall be informed as soon as possible of any incident on site.

Operations Manager will notify the Aggreko QHSE Manager and the client. If required, Aggreko will notify emergency services, statutory government organisations for any additional response agency for assistance and will coordinate the activities.

Aggreko will have a site emergency plan and will ensure emergency and medical services location and contact details displayed at site and incorporated in the site inductions.

12.2 WEATHER PRECAUTIONS

When working in extreme weather conditions, all personnel must ensure and take the proper level of self-security and take the necessary measures.

Other specific requirements are to be discussed with the client on a site-to-site basis e.g. cyclone, earthquake.

12.3 FIRE PREVENTION

All required measures will be put in place to prevent any fire. Some of the measures may be fire suppression and/or detection, adequate quantity and appropriate types of firefighting equipment at strategic locations, fire training, fire drill, storing flammable items in a fireproof cabinet, smoking in designated area away from flammable items.

Adequate procedures and controls will be in place to contain and manage water and combustion products left over after a fire emergency and including prevent the discharge into the sewer or stormwater systems, discharge or seep into land or groundwater associated with the affected site or its adjacent sites.

Aggreko will supply firefighting equipment at each identified location within any site.

- Enough dry chemical fire extinguishers, each with a minimum capacity of 4.5 kilograms, are provided where flammable liquids and/or substances are stored, handled or used.
- Ensure fire extinguishers are always within their test date.
- Fire extinguishers must be inspected every six months.
- Fire extinguishers once used, even if partly, must be promptly replaced with a new one.

12.4 ENVIRONMENTAL RESPONSE

The type of response will be dictated according to the type of incident/event/emergency, whereby the responders will follow the set Aggreko procedures under the control of the Aggreko senior site manager, appropriately competent Aggreko leader at site.

13.0 AUDIT, PERFORMANCE REVIEW & CONTINUAL IMPROVEMENT

13.1 AUDITING

Environmental documented audits are planned and frequency determined on the following:

- The status, importance and criticality of areas, processes, products and activities to be audited and their impact on performance and compliance with Aggreko's policy/procedures with statutory regulatory requirements.
- Results of previous internal and external audits.



13.2 REPORTING

Reporting of audited findings (documented) is to be communicated to the relevant Aggreko functional managers for consultation to determine, implement and assign the corrective action with a suitable timeframe.

Other reporting requirements outside of internal, external or client audits are to be determined as and when identified as being a requirement.

13.3 DAILY REPORTS

Environmental daily reporting will be discussed in the 'Daily Toolbox' meeting, ensuring all personnel on site are aware of the objectives or changes. This will allow personnel an opportunity to raise any Health, Safety or Environmental concerns or operational issues that need to be resolved but can also be raised on a one-to-one basis with the site managers.

Daily meetings are compulsory where more than one Aggreko personnel, including sub-contractors is on site.

13.4 MONTHLY REPORTS AND AD-HOC REPORTING

Monthly reports are to provide an overview of any HSE incidents, safety alerts and/or any significant learnings.

Reports of an ad-hoc nature are to be determined as and when required. The requirement may come from the client, Aggreko management or any regulatory body. The type of ad-hoc reporting shall be stated clearly at the time of request with clear guidance as to what information is required.

13.5 REPORT MAINTENANCE

Any reports produced shall be managed and maintained by the projects, operations and/or the HSE function of Aggreko.

Reports should be kept electronically within the Company server location allocated and/or in the relevant Aggreko SharePoint locations.

13.6 MONITORING OF AUDITS AND REPORTING

Monitored audits and reporting is in alignment with ISO 9001, ISO 45001 and ISO 14001.

14.0 CONSULTATION AND COMMUNICATION

14.1 KICK OFF MEETINGS

The project manager and subsequently, the Project Lead and Operations Manager are to liaise with the nominated client representative for incorporating an effective communication system on the project.

The project and operations communication systems are to identify:

- Environmental, Cultural & Heritage requirements
- Equipment
- Call Signs
- Method of obtaining prompt first aid and emergency assistance
- Other requirements of the project and/or operations Manager.

14.2 HSE MEETINGS

Site Safety & Environmental meetings (toolbox meetings/pre-start) will be held daily, by the site supervisor, and include:

- Any safety & environmental alerts/bulletins.
- Fitness for duty.
- Review Principal Contractor's daily report.
- Review master SWMS and revise for any changes associated with planned work for the day.
- Opportunity to raise safety, environmental or task issues.
- Ensure all personnel have and are wearing PPE.



The Project Lead/Operation Manager is responsible for:

- Recording the safety and environmental meeting.
- Ensuring that all personnel sign the attendance sheet.
- Distributing and communicating safety and environmental advice to and from the Principal Contractor or other relevant parties.

14.3 INTERNAL COMMUNICATION

Consultation with workers on HSE matters takes place in various forums e.g. weekly safety meetings, toolbox talks, training, risk assessments, incident investigations etc. All workers are encouraged to discuss HSE concerns as well as suggestions for improvements with their Supervisors/Managers and/or nominated HSE representatives. Such discussions are usually backed up with risk reporting through Aggreko's Global Risk and Incident Database.

14.4 EXTERNAL COMMUNICATION

Consultation regarding changes affecting the project HSE such as introduction of new, or modified equipment, material, chemicals, technologies, process, procedures, acts, legislations, work method is to be carried out prior to such occurrence to ensure that the employees have the opportunity for inputs and are aware of the ensuing changes. Changes affecting interested parties, for example, neighbors', customer, subcontractor, supplier will be conveyed to them well in advance.

15.0 INFORMATION MANAGEMENT AND DOCUMENT CONTROL

15.1 DOCUMENT AND RECORD CONTROL

All Aggreko HSE documents are controlled. They are developed, implemented and maintained to ensure necessary controls are implemented for creating, reviewing, approving and maintaining new and revised documents. Suitable identification methods are applied to obsolete documents to prevent their unintended use. Documents can be of any type including but not limited to procedures, flowcharts, registers, index, plans etc.

All the internal and external documents developed and used for planning and operation of HSE are listed in a document register, where the latest version of document is hyperlinked for readily identifying and accessing a document. Document revision history, owner, format, last reviewed, next review and subject matter expert are recorded in document register.

Documents will be created and updated electronically, and printed copies will be uncontrolled. Only PDF versions of procedures will be available to employees via Sharepoint on a common drive or through Aggreko intranet (My Aggreko) which can be accessed by all. Editable (i.e. fillable) versions of standard registers, forms, checklists etc. required for local implementation of HSE will also be made available in the same common location as the HSE procedures.

Editable versions of standard procedures and templates will only be available to the document controller or delegate for the purposes of preparing new or revised procedures and templates.

15.2 CONTROL OF DOCUMENTED INFORMATION

Records established to demonstrate evidence of conformity to requirements and of the effective operation of HSE are controlled and retained

HSE records will be legible, suitably identified, traceable to the activity and maintained in a safe and secure manner. Records will be stored in such a manner that they can be easily retrieved and will be protected against damage and deterioration. Records will have a specific retention period as per organisational requirement and legal requirements. Records can be disposed of, in consultation with the Department Manager, after the retention period is over.

All the records created to demonstrate the effective operation of HSE are listed in the document register that specifies responsible persons for retaining the records, retention periods and the location where the records are kept.



16.0 CHANGE MANAGEMENT

Effective Environmental Change Control processes maintain the appropriate balance between control/discipline to manage to the baseline EHS plan and flexibility to adapt the plans to meet customer/stakeholders' expectations.

Change requests will be communicated to the entire Project team to ensure the most appropriate solution is found and implemented.

17.0 INCIDENT REPORTING, INVESTIGATION AND REVIEW

17.1 INCIDENT MANAGEMENT

Environmental incidents may affect the environment and the community at different levels and could lead to ongoing ecological damage. Aggreko is committed to ensuring that if an incident occurs, the threat to our workers and environment is minimised.

Where an incident occurs, where it poses a significant risk, it shall be reported to the AusPac QHSE function and the Managing Director immediately. The AusPac QHSE Manager and the Managing Director will liaise to assemble an incident response team. This team will typically include the AusPac QHSE Manager, Managing Director, Project Manager, HR Manager and any other members of senior management as necessary.

The incident response team will take control of the situation and the incident investigation that takes place following an incident will typically be in accordance with relevant procedures and or legal obligations. There may be slight variations to this, as appropriate to the situation. This will be at the discretion of the AusPac QHSE function and their team, who are trained in incident investigation.

Following the initial incident response, the actions will be allocated to the appropriate person in the team.

17.2 INCIDENT REPORTING

Accidents, incidents and near misses shall be recorded on a global risk and incident reporting system and investigated. The Project Lead/Operations manager shall be informed as soon as possible of any incident on site. The Project Lead or Operations Manager will in turn notify the Aggreko QHSE Manager as soon as possible.

There is also a requirement to report and investigate to RTA GOVE Operations.

17.3 INCIDENT INVESTIGATION

Incidents that require investigation, the responsible Manager or the AusPac QHSE Function shall make this determination based upon severity.

The primary objective of incident investigations is prevention of future accidents. Specific serious incidents will require referral and involvement of legislated regulatory investigation and legal consultation.

Investigations shall always be kept objective, factual and free from any attempt to apportion blame.

The level and depth of investigation will depend on the actual severity or potential severity.

The investigation process shall always be aimed at identifying the root cause of each incident.

17.4 INCIDENT REVIEW

Following an incident response or notifiable incident investigation, the AusPac QHSE Function shall undertake a review of the incident response process to ensure that it is effective and identifies any opportunity to improve the procedures.

The AusPac QHSE function shall maintain records of this process, typically in the form of notes, meeting minutes, emails, revised procedures etc.



Where identified and relevant, continued liaison with RTA Gove Operations regarding any key learning shall be maintained.

