Mining Management Exploration Activities

Northern Territory of Australia – *Mining Management Act 2001*

It is recommended that the Mining Management Plan (MMP) is completed in conjunction with the user guide available on the Northern Territory Government website.

Section 1 – Project Details

Project Name Provide new or existing project name	Maud Creek

Authorisation Number Insert existing authorisation number, where applicable	0524-02

Operator Name Use ASIC-ABR registered name (if a company), or name of the applicant	NT Mining Operations Pty Ltd
Operator ABN and ACN numbers	ABN: 64 136 525 990 ACN: 136 525 990

Location and Access Details Include brief description of the location, access details, and distance to nearest town or community	The Maud Creek Project is situated 21 km east of the town of Katherine NT and 280 km southeast of Darwin. The preferred access is via the Stuart Highway, 22 km ESE of Katherine, turning left onto Ross Road. After 1.2km travel along Ross Road turn left (north) past the Maud Creek Station homestead, and travel north for 10km along station firebreaks and fence lines, following the route of the AngloGold haul road.

Target Commodity Details Include target mineral commodities (i.e. gold, copper etc.)	Gold

Mining Activities Summarise the mining activities (exploration) to be the subject of the proposed Authorisation or Variation. Drilling programs over a maximum of four years are supported and encouraged and can be staged. Please refer to the guidelines for further information.	An exploration program of 12 drill holes is planned. Drilling will be Diamond (DDH). Previous granted Authorization communication of holes in the area of MCNDD0006-MCNDD0011 that were not drilled and are proposed for drilling for this programme have been attached to this application in a separate folder for reference under Authorization V5 -0524-02

Proposed Schedule Include start and finish dates of ground disturbing work	Work is planned to commence on the 24th of April, 2023.

Mining Interest and Land Ownership

List the mining interests (titles), the title holder name/s, the title expiry date and the Property name/Land holder (e.g. pastoralist or Aboriginal land trust) for each title.

Title Number	Title Holder	Expiry Date	Underlying Property Name or Land Holder
ML30260	NT Mining Operations Pty Ltd	13/04/2024	Maud Creek Station (N.T. Por 7056)

Delete or add rows as required

Please note a Land Access Agreement (LAA) is required for disturbance proposed on Pastoral Properties on Exploration Licence (EL).

Organisational Structure

Position Title	Name
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Section 2 – Operator Self-Assessment of the Environmental Risk

The purpose of this self-assessment is to ensure Operators complete a project risk assessment of potential environmental impacts and are aware of other legislative obligations from various Agencies. As a result of this self-assessment, further information may be required in the form of a management plan to enable full assessment of the MMP. If you have any queries please contact a Mining Officer prior to submitting the MMP. Useful resources to assist with this self-assessment are provided in the User Guide.

Environmental considerations

ASSESSMENT ASPECT	YES or NO	ACTIONS REQUIRED (if answered YES)	APPENDED INFORMATION (e.g. evidence of consultation with DEPWS and/or management plan where required).
Step 1: Are there any threatened flora and fauna species or habitats of significance that may occur in the proposed work area?	YES	There is potential for threatened fauna species to occur in the MCPA. The main control for managing potential risk to known vulnerable flora species in the project area is the requirement for personnel to seek approval from the NTMO Environment Department for a Clearing/Ground Disturbance Permit before approval. This process requires an area walkover prior to the issuing of Clearing/Ground Disturbance Permit. NR maps, FloraNT and field guides will be used in conjunction with assessment of area before permit will be issued, to highlight areas of potential vulnerable flora. Further, NTMO site disturbance checklists include checks to ensure that access tracks and drill pads do not impact on vulnerable flora species. All other fauna and flora management and monitoring will be undertaken in line NTMO Flora and Fauna EMP.	EPBC Protected Matters Search Tool Results NR Map – Fauna Results NTMO - Clearing/Ground Disturbance for 2023 programme NTMO Flora & Fauna EMP Significant Species Management Plan_ Maud Creek Maud Creek Targeted Survey Terrestrial and Aquatic Ecology report 2019

ASSESSMENT ASPECT	YES or NO	ACTIONS REQUIRED (if answered YES)	APPENDED INFORMATION (e.g. evidence of consultation with DEPWS and/or management plan where required).
Step 2: Are there any known declared weeds within the proposed work area?	YES	Where new machinery or vehicles are brought to any of NTMO project areas, a weed and seed inspection is undertaken in order to prevent spread and introduction of new species. Declared weed species present in the MCPA include: • Flannel Weed • Hyptis • Perennial Mission Grass • Rubber Bush • Sicklepod NTMO will undertake a range of mitigation measures to prevent the introduction of new species which include: • Record and monitor management progress. • Establish an integrated weed management action. • Prevention and Hygiene. • Education; and • Control methods for existing or newly established species	NTMO Weed and pest EMP NR Maps – Threatened, Significant and Vulnerable Flora Results Weed and Seed Inspection Template
Step 3: Will you be using water from bores or other sources for the operation?		Water will be sourced from Maud Creek Pit within the ML. Due to MCPA being an active cattle station, Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle) is also used for surface water analysis and falls within Guideline standards.	2021-2022 Surface Water Quality of Maud Creek Pit

Environmental assessment and cultural considerations

ASSESSMENT ASPECT	YES or NO	MANAGEMENT REQUIREMENTS
Step 4: Is your project likely to have a significant impact on the environment?	NO	NTMO believe that by following the EMPs attached, these activities will not have a significant impact on the environment. Continuation of fauna surveys during the drilling will also be completed as previous year.

ASSESSMENT ASPECT	YES or NO	MANAGEMENT REQUIREMENTS
Step 5: Are there Aboriginal sacred sites in the Project area?	YES	Aboriginal sacred sites are located in and around ML30260.

MAUD CREEK MINE SACRED SITES WITHIN AND AROUND MAUD CREEK TENEMENTS		POSITION	
		GRID: UTM; DATUM: WGS84; ZONE 53L	
SITE CODE	DESCRIPTION / COMMENTS	EASTING	NORTHING
SACRED SITES			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

[redacted] Areas are illustrated on the Map attached to this amendment.

Further, all disturbances are managed through a permitting system. Part of this process is to undertake on the ground and desktop studies to identify any archaeological or heritage sites. As shown in attached map, all heritage areas can be identified during mapping. Environmental Officers will take appropriate measures to avoid impact to the declared sites including new findings while conducting the permitting checklist.

<table>
<tr><th>ASSESSMENT ASPECT</th><th>YES or NO</th><th>MANAGEMENT REQUIREMENTS</th></tr>
<tr><td>Step 6:
Are there archaeological and heritage sites in the Project area?</td><td>YES</td><td>Archaeological and heritage sites and their level of significance within the proposed drilling area has been listed in the table below.
<table>
<tr><th colspan="2" rowspan="2">MAUD CREEK MINE SITE HERITAGE & WITHIN AND AROUND MAUD CREEK TENEMENTS</th><th colspan="2">POSITION</th></tr>
<tr><th colspan="2">GRID: UTM; DATUM: WGS84; ZONE 53L</th></tr>
<tr><th>SITE CODE</th><th>DESCRIPTION / COMMENTS</th><th>EASTING</th><th>NORTHING</th></tr>
<tr><th colspan="4">HERITAGE SITES</th></tr>
<tr><td>MCHR BS1</td><td>Retouched Flake</td><td>222892</td><td>8400410</td></tr>
<tr><td>MCHR BS2</td><td>Unretouched flake</td><td>224123</td><td>8401160</td></tr>
<tr><td>MCHR BS3</td><td>Unretouched proximal flake</td><td>222945</td><td>8400436</td></tr>
<tr><td>MC1</td><td>Artefact Scatter</td><td>224900</td><td>8401400</td></tr>
<tr><td>MC2</td><td>Artefact Scatter</td><td>224200</td><td>8401200</td></tr>
<tr><td>MC3</td><td>Artefact scatter</td><td>224100</td><td>8401200</td></tr>
<tr><td>MC4</td><td>Quarry</td><td>224300</td><td>8401200</td></tr>
<tr><td>MC5</td><td>Artefact Scatter</td><td>224400</td><td>8401100</td></tr>
<tr><td>MC6</td><td>Historic Mine</td><td>225900</td><td>8401800</td></tr>
<tr><td>MC7</td><td>Artefact Scatter/Quarry</td><td>224800</td><td>8403590</td></tr>
<tr><td>MC8</td><td>Artefact Scatter</td><td>224800</td><td>8403000</td></tr>
<tr><td>MC9</td><td>Historic Settlement</td><td>226150</td><td>8402200</td></tr>
<tr><td>MC10</td><td>Artefact Scatter</td><td>225670</td><td>8402540</td></tr>
<tr><td>MC11</td><td>Artefact Scatter</td><td>225750</td><td>8402750</td></tr>
<tr><td>MC12</td><td>Quarry</td><td>224100</td><td>8402500</td></tr>
<tr><td>MC13</td><td>Artefact Scatter</td><td>226130</td><td>8400172</td></tr>
<tr><td>MC14</td><td>Artefact Scatter</td><td>225005</td><td>8400947</td></tr>
<tr><td>MC15</td><td>Artefact Scatter</td><td>224785</td><td>8400403</td></tr>
<tr><td>MC16</td><td>Artefact Scatter</td><td>225180</td><td>8400608</td></tr>
<tr><td>MC17</td><td>Artefact Scatter</td><td>225294</td><td>8400768</td></tr>
<tr><td>MC18</td><td>Artefact Scatter</td><td>224520</td><td>8400453</td></tr>
</table>
Although the drilling area has been disturbed by previous earth work activities, all archaeological and heritage management will be undertaken as per EMP.</td></tr>
</table>

Section 3 – Amendments

As per Section 41(3) of the *Mining Management Act*, an MMP reviewed and amended under Section 41(1)(a) is to have amendments made since the previous MMP submission clearly identified.

Section	Amendment

Delete or add rows as required

Section 4 – Activities Proposed for this MMP only

Provide relevant EL numbers

Mining Interests (i.e. titles)	**ML30260**
Number and type of proposed exploration drill holes	12 DDH
Maximum depth of proposed holes (m)	550m
Number and size of drill pads to be cleared (Length: m x Width: m)	12 pads 20x 30m
Total area of drill pads to be cleared (ha)	0.72
Number of proposed water bores	0
Is drilling likely to encounter groundwater in multiple or confined aquifers? (Y, N, unsure) If answering yes, please provide the number of exploration holes where this is likely to occur	Yes. Producing water bores exist on Maud Creek Station and expect may intersect water. Holes to be grouted upon completion.
Number of costeans	36 drill sumps
Volume to backfill costeans (Length: m x Width: m x Depth: m)	4m x 2m x 1m
Number of bulk sample pits	0
Volume to backfill bulk sample pits (Length: m x Width: m x Depth: m)	0
Bulk sample pits approved under *Mineral Titles Act*? (Y or N). If Yes provide approval	N/A
Line/track clearing: (length m x width m)	1960m x 3m

Mining Interests (i.e. titles)	**ML30260**
Area of proposed line/track clearing (ha)	0.59
Camp area to be cleared (ha)	0.0 (Use previous years' camp area, no additional disturbance required).
Camp Infrastructure (i.e. demountable, tents) Please provide a complete list with measurements as required in the security calculation	2 Explorex caravans Potable water tank
Other	
Total proposed area of disturbance (ha)	1.31ha

Staging approach based on disturbance can be proposed and will be considered by the Department.

Section 5 – Previous Disturbance (for existing Authorisations only)

The 'Disturbance Tracking' spreadsheet must be completed and attached to the MMP submission to complete this section. The spreadsheet is available on the departmental web page where this template is located.

Section 6 – Environmental Management

By checking these shaded boxes, you are agreeing to implement the following minimum environmental management standards on the project area. Where boxes have been left unchecked, justification is required.

6.1	✓	Blade-up approach for clearing will be used (i.e. no windrows, leave root stock and topsoil)
6.2	✓	Significant vegetation will be avoided during clearing (i.e. large trees, specimens providing habitat or food sources, riparian vegetation, and threatened species)
6.3	✓	Vegetation clearing during, and immediately after rainfall events, will be avoided
6.4	✓	Vegetation clearing will be kept to the minimum required to safely traverse vehicles and drill rigs along tracks and drill pads
6.5	✓	Where blade-up techniques cannot be employed, topsoil and vegetation will be stockpiled appropriately for rehabilitation purposes
6.6	✓	All employees and contractors will be trained and inducted in relation to the management of environmental risks in the work area, including weeds, waterways, threatened species, soil erosion, sacred sites and heritage areas
6.7	✓	Sumps will be lined or tanks of appropriate size to contain water, sediment and drilling fluids encountered during drilling, will be used
6.8	✓	Sumps, drill holes, and fuel stores will be located away from environmentally significant areas and water courses
6.9	✓	Excavations (sumps, costeans and pits) will be appropriately ramped to allow fauna egress
6.10	✓	Drill holes will be securely capped immediately after drilling
6.11	✓	Vehicle hygiene measures will be employed to prevent the introduction and spread of invasive species and pathogens when mobilising vehicles and equipment from one location to another
6.12	✓	Hydrocarbon spills will be minimised using liners and drip trays under machinery, and appropriately sized spill-kits available in the event of a spill
6.13	✓	Hazardous substances (including hydrocarbons) will be stored and handled in accordance with relevant Australian Standards
6.14	✓	Hydrocarbons will be stored in lined and bunded areas
6.15	✓	Waste will be stored securely while on-site to minimise windblown rubbish and access by feral animals
6.16	✓	Waste will be removed off-site and disposed of at an appropriate waste management facility
6.17	✓	All environmental incidents will be reported to the Department in accordance with Section 29 of the *Mining Management Act.*
6.18	✓	Acid and Metalliferous Drainage (AMD) and Potentially Acid Forming (PAF) material derived from drilling cuts will be managed to avoid AMD and PAF related issues on site.

6.19	✓	Radioactive/NORM drill cuttings will be managed to avoid radiation related issues on site.
6.20	✓	Dust management will be implemented on site.

Justification and alternative management measures:

Section 7 – Rehabilitation and Closure

By checking these shaded boxes, you are agreeing to implement the following minimum rehabilitation standards on the project area. Where boxes have been left unchecked, justification is required.

A refund of security related to completed rehabilitation on site requires the submission of a rehabilitation report including photographs, an updated security calculation and updated disturbance tracking spreadsheet to the Department.

7.1	✓	Drill holes will be plugged below ground level at a minimum depth of 0.4 metres and soil mounded to prevent subsidence, within 6 months of completion of drilling.
7.2	✓	Drill holes encountering multiple or confined aquifers will be grouted with concrete.
7.3	✓	Drill samples/spoil will be returned down drill holes, buried in sumps, or removed from site.
7.4	✓	All drill hole and access markers including flagging tape, wooden markers and star pickets will be removed from site.
7.5	✓	Cut and fill drill pads will be re-contoured to be consistent with the surrounding terrain.
7.6	✓	Drill pads and compacted areas along the contour (on sloping ground) will be ripped/scarified of and tracks will be cross-ripped (zig-zag).
7.7	✓	Tracks will be rehabilitated, including pushing in all windrows, unless otherwise agreed in writing by the land holder or appropriate third party.
7.8	✓	Appropriate erosion and sediment controls will be installed where erosion is evident or likely to occur.
7.10	✓	Access through watercourses will be removed and banks restored.
7.11	✓	All previously disturbed areas will be stable, with no evidence of active soil erosion.
7.12	✓	All excavations will be backfilled within 6 months of their completion.
7.13	✓	All water bores will be decommissioned unless otherwise agreed in writing by the land holder or appropriate third party.
7.14	✓	All rubbish and infrastructure will be removed from site.
7.15	✓	Topsoil will be replaced and vegetation re-established.
7.16	✓	Contaminated soils (e.g. hydrocarbon or hazardous chemicals) will be rehabilitated or removed from site.
7.17	✓	Monitoring will be undertaken following the wet season or a significant rainfall event.

Justification and alternative management measures:

Section 8 – Required Attachments

8.1	X	Initial Application for Authorisation or variation of Authorisation (only if details on the form have subsequently changed).
8.2	X	Nomination of Operator Form, where required
8.3	✓	Security Calculation Spreadsheet
8.4	X	Evidence of Land Access Agreement if operating on an Exploration Licence (EL) on Pastoral Lease (e.g. two-ways exchange of email)
8.5	✓	Disturbance tracking spreadsheet (for existing Authorisations)
8.6	✓	Spreadsheet with coordinates of proposed drill holes or polygons of target areas
8.7	✓	KML/shape files/track logs of proposed tracks, camp sites and proposed drill holes or polygons of target areas
8.8	✓	Map(s) of the work area(s) showing: 1. title boundaries and title numbers 2. current and proposed drill holes, or polygons of target areas 3. current and proposed tracks 4. rehabilitated areas 5. camp sites 6. heritage sites or significant environmental areas 7. environmental constraints
8.10	X	Radiation Management Plan (if applicable)

8.12	✓	Document(s) being appended in relation to Section 2 (if any): • EPBC Protected Matters Search Tool Results • NR Map – Threatened & Significant Fauna Results • NTMO - Clearing/Ground Disturbance for 2023 programme. • NTMO Flora & Fauna EMP • Significant Species Management Plan_ Maud Creek • NTMO Weed and pest EMP • NR Maps – Threatened & Significant and Vulnerable Flora Results • Surface Water Quality of Maud Creek Pit • NTMO Cultural & Heritage EMP • Maud Creek Targeted Survey Terrestrial and Aquatic Ecology

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: 03-Apr-2023

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:	1
Listed Threatened Species:	16
Listed Migratory Species:	15

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:	20
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:	1
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
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 Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, 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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Arnhem Plateau Sandstone Shrubland Complex	Endangered	Community likely to occur within area

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		
Amytornis woodwardi White-throated Grasswren, Yirlinkirrkirr [564]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat known to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
[Geophaps smithii smithii](#) Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat likely to occur within area
[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		
[Antechinus bellus](#) Fawn Antechinus [344]	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 known to occur within area
[Phascogale pirata](#) Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat may occur within area
[Saccolaimus saccolaimus nudicluniatus](#) Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
[Trichosurus vulpecula arnhemensis](#) Northern Brushtail Possum [83091]	Vulnerable	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		

Scientific Name	Threatened Category	Presence Text
[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
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may 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]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
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 veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		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

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within 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 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 may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may 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
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

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Nitmiluk	National Park	NT

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Trans-territory Gas Pipeline	2003/1186	Controlled Action	Completed
Not controlled action			
Maud Creek Gold Project	2006/3205	Not 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

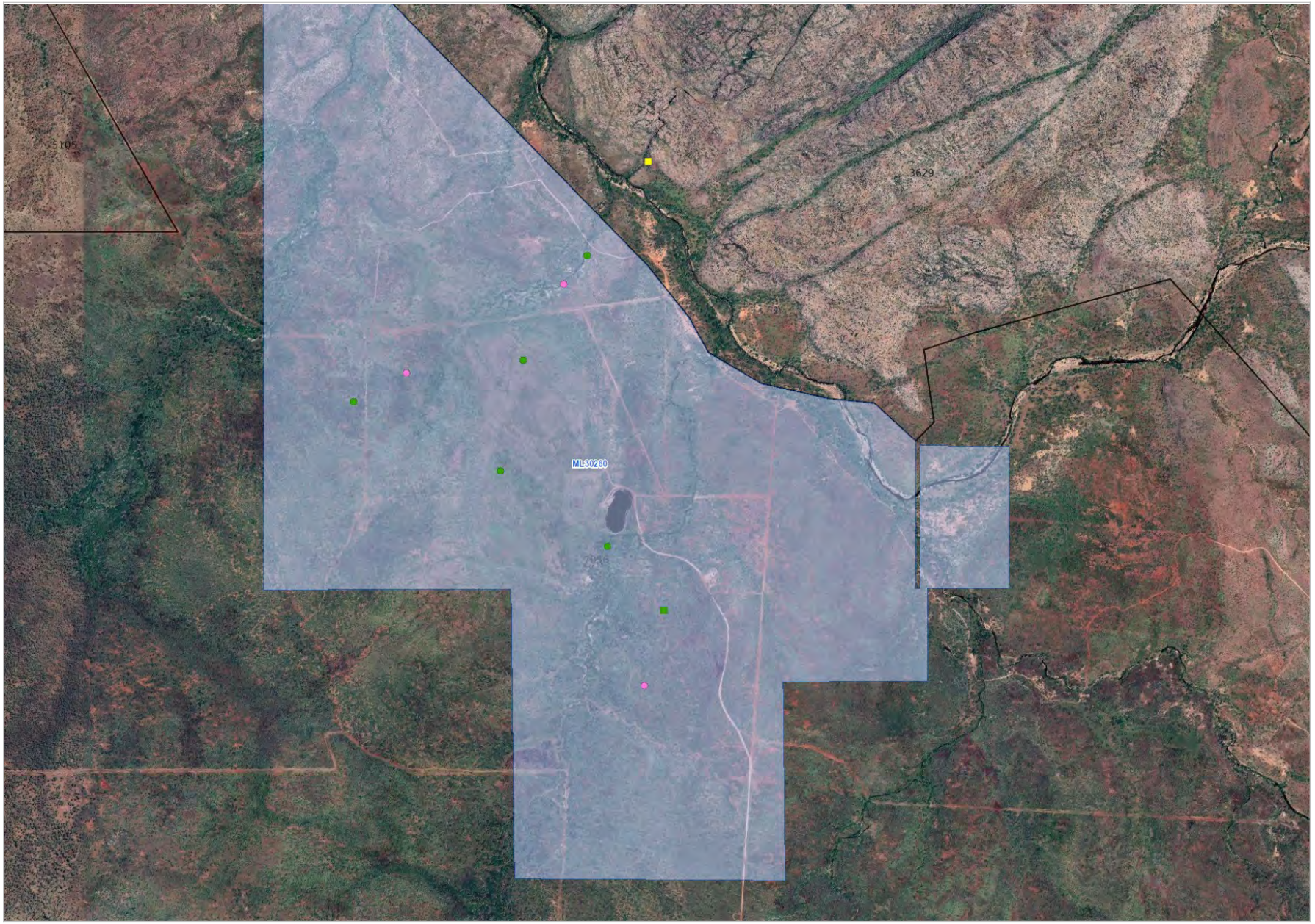
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

NR MAPS

ML30260 - Flora and Fauna



Legend

- Threatened Flora
- Restricted Range Flora
- SignificantFlora
- Threatened Fauna
- Significant_Fauna
- Extractive Mineral Exploration Licences - Granted
- Other Mineral Titles - Granted

N

Metres 250 500 750 1,000

nrmaps.nt.gov.au

Geospatial Services Branch

Created by anonymous, 03 Apr 2023

INSTRUCTIONS

This form is to be completed prior to work commencement, where vegetation clearing/ground disturbance is intended.

Clearing / Ground Disturbance can be defined as and not limited to the following:

1) Creation of tracks/access/drill pads/fire breaks
2) Tree lopping
3) Vegetation removal or relocation
4) Digging of pits/sumps

Works must be completed within the validity period/prior to the expiration date; otherwise, the issued permit will need to be reviewed and re-signed to ensure all information is still accurate.

Responsibilities:

- Section 1–3 – Disturbance Description – Applicant to complete
- Section 4 – Area Descriptions – including photos – Environmental Department to complete
- Section 5 – Environmental & Archaeological considerations – Environmental Department to complete
- Section 6 – Maps of proposed clearing area
- Authorisation – Signed by Applicant, Environmental Department & Clearing Operation

Environment Department:

This Permit is true and correct at the time of signing. Applicant(s) have acknowledged and understood conditions set out on this Permit.

The final area of clearing has boundaries marked (with exceptions*)

D.I.T.T guidelines have been adhered to during this permitting process

EMER MCGOWAN	*Environmental*	Emer McGowan	08/05/2022
Environmental Officer	Department	Signature	Date

PERMIT# MC08 – 2023 Drill Pads

SECTION 1: General Information

Project Area: Maud Creek Project Area

Location: Area near current access and fence line track

Disturbance Dimensions: 20M X 30M X 12

Previously Disturbed Site? ☒ Yes ☐ No

Estimated Area to be Disturbed 7200M² (pad)s & 6300M² (tracks)

Expected Disturbance: Date Next 2 months

Type of Disturbance: Drill Pad Preparation

☐ Permanent ☒ Temporary

Expected Rehabilitation Date: Before 2023 Wet season

SECTION 2: Purpose and Description

☒ Exploration ☐ Mining ☐ Pipeline

☐ Other (specify):

Description of Activities:

12 x 30m x 20m Drill pads for exploration.
Sumps included in this area
Drill holes to be conducted on each pad.
Coordinates below of drill collars.

PadID	HoleID	MGA94_Z53_E	MGA94_Z53_N
MNE_0008	MCNDD0006	225480	8402335
MNE_0009	MCNDD0007	225533	8402325
MNE_0010	MCNDD0008	225376	8402412
MNE_0011	MCNDD0009	225464	8402422
MNE_0012	MCNDD0010	225407	8402521
MNE_0013	MCNDD0011	225458	8402522
MNE_0014	MCNDD0012	225739	8402055
MCE_0001	MCCDD0001	225606	8400053
MCE_0002	MCCDD0002	225672	8400254
MCE_0003	MCCD00003	225886	8400068
MJE_0001	MCJDD0001	226760	8401441
MJE_0002	MCJDD0002	226830	8401220

***Holes MCNDD0006-MCNDD0011 are in areas of already approved drilling authorizations with some adjustment to coordinates**

SECTION 3: Type of Surface Disturbance

☐ Topsoil stripping	Volume (approx..) (m^3):		
☒ Vegetation removal			
☐ Surface water flow alteration	☐ Yes	☒ No	*If yes, provide details here:*
☐ Regulatory approval required	☒ Yes	☐ No	Approval date: to be confirmed

SECTION 4: Area Descriptions

Description	Vegetation Units				Details
	Yes	No	N/A	Open Y/N	
Grassland terrain		✓			
Shrubland terrain		✓			
Woodland terrain		✓			
Mixture of terrain	✓			Y	Low woodland to low open woodland on sandy loams and red earths on undulating terrain Small Intermittent stream in area (stream order of 1)
Riparian terrain		✓			
Pre-disturbed area	✓				Fence line and Firebreak adjacent to area

Vegetation Species present?

Eucalyptus miniate - Darwin woollybutt	*Terminalia platyphylla* - wild plum
Eucalyptus tectifica - Darwin box	*Corymbia grandifolia* - cabbage gum
Erythrophleum chlorostachys - Cooktown ironwood	*Corymbia dichromophloia* - small-fruited bloodwood

Fauna Species present?

Northern Rosetta	Willy Wag Tail
Peaceful Dove	Ta-ta Lizard
Black Cockatoos at main gate into Maud Creek	

Habitats located

Habitats present	Yes	No	Photo taken and flagged?	GPS Coordinates of found habitat	Easting	Northing
Hollows		✓	×	×	×	×
Nests	✓		✓	✓	225432	8402545
Burrows		✓	×	×	×	×
Logs		✓	×	×	×	×

- Small Nest found outside approx. 100m away from proposed Pad area MCNDD0011

Photos

- Small next found approx. 100m away from proposed clearing area

- Not within clearing zone of either pad or access track

Photos

MCNDD0012- Access and Pad

•Nearest pad to a stream order 2 drainage line – pad outside of buffer of 25m from bank of creek.

•1 hole planned for this pad.

•Some trees and shrubs in drill pad area. Including some dead trees with no hollows apparent upon inspection.

•Mostly spear grass and vine weed covered area, established tree to remain located on the boundary of the pad, flagged for reference

•Access from along fence line then small track to pad.

Photos

MCNDD008/009

•Area quite clear of trees.

•Some shrubs and grass covered mostly.

•Just off current access tracks

•Access directly off current access track along fence line

•Some trees and shrubs in drill pad area with a dead tree also to be cleared which was inspected for hollows.

•Mostly spear grass and vine weed covered area,

MCNDD006/7 -Access & Pads

- Shrubs and grass covered
- No established trees in track clearing area
- Access from along fence line then small track to pad.
- Some uneven ground near pads
- All established trees are to be saved where possible with boundary moved to allow an established tree to remain

MCDD0010/11 – Access and Pads

- No trees to be cleared of either pads
- Grass and weed coverage high
- Some uneven ground in areas
- Access from along fence line than small track to pads
- Nest found located outside approx. 100m away from proposed Pad area MCNDD0011

MCJDD001/2- Access and Pad

- Track to be has incline to pad area avoiding clearance of trees
- All established trees are to be avoided where possible
- Mainly grass covered area
- 3 Dead trees with no hollows present to be cleared and replaced on pad during rehabilitation of pad for MCJDD001
- MCJD002 Area has some established trees to be cleared where, trees will be replaced on pad during rehabilitation

SECTION 6: Environmental Considerations

Aspect	Addressed?			Details *If yes, provide details and attach supporting documents. If no, provide details why.*
	Yes	No	N/A	
Compulsory Area surveyed and marked out?	✓			Corners flagged and center pole in place (pink flagging for pad, orange for track)
Has Survey Plan / Drawing been developed with correct GPS coordinates and projection system?	✓			Map Attached
Surface water flow alteration required?			✓	
Creeks in Vicinity? Buffer Zone established according to stream order.	✓			Small drainage line near pad MCNDD0012 25m buffer established and pad relocated further away from buffer zone
Ground water management required?			✓	
Heritage / Archaeology assessment completed?	✓			No new finds upon inspection
Topsoil to be used for bunding?	✓			Bunding to occur around pad and sumps

Date of Initial site inspection completed: 04/04/2023

Site Description:

Area of pads off current fence line and access tracks
Drainage line/ Intermittent stream currently dry
Red Soil terrain
All established trees checked for hollows nest none found within pad boundary.
Mostly shrubs to be cleared with none of significance listing
Pad MCNDD0012 moved further away from stream line to facilitate 25m buffer and extra applied
Pad MCJDD001/2 has incline to pad area, pad will be constructed to facilitate potential run-off with additional elevated bunding.
All sumps within pad boundaries are to be checked daily for potential trapped wildlife and spills with extra precaution for pads located with higher potential of run-off.
Any sighting of fauna to be communicated to the environmental department for reevaluation of potential sustained habitat

Application Outcome ☒ Approved ☐ Rejected

Permit ID MC08

Permit Validity/Expiration Date: 6 MONTHS

AUTHORISATION

Applicant:

This Permit is true and correct at the time of signing. Any further alterations will require a variation undertaken by the Environment Department.
If a later version of this Permit has been issued, it will be deemed as current and the superseded version will be no longer valid.

The final area of clearing has boundaries marked (with exceptions*)

I accept the conditions set out in this Permit and any breaches must be reported to the Environment Department immediately for rectification.

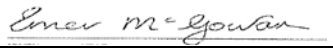
Name	Department	Signature	Date

Environment Department:

This Permit is true and correct at the time of signing. Applicant(s) have acknowledged and understood conditions set out on this Permit.

The final area of clearing has boundaries marked (with exceptions*)

D.I.T.T guidelines have been adhered to during this permitting process

EMER MCGOWAN	*Environmental*		08/05/2022
Environmental Officer	Department	Signature	Date

Clearing Operator (if required):

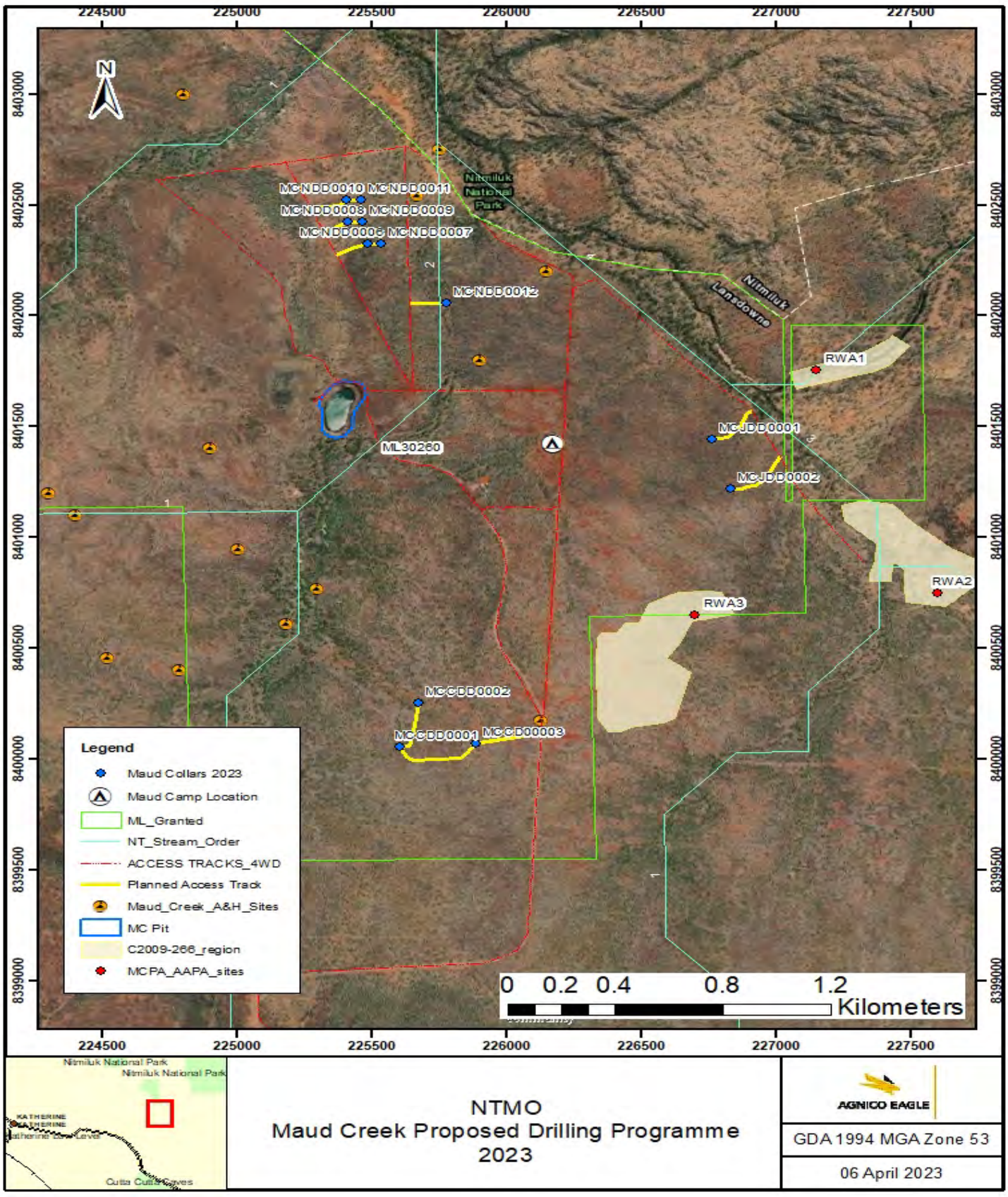
I have read and understood this document and am informed of the works to be undertaken.

I accept the conditions set out in this Permit and any breaches must be reported to the Environment Department immediately for rectification.

Name	Department/Company	Signature	Date

* Exceptions apply where it is unable/physically unsafe to be done (e.g. lopping of tree branches).

Map of Proposed Clearing



TO BE USED BY ENVIRONMENT DEPARTMENT IF VARIATION IS REQUESTED

Revision Number:

Reason for requesting revision (including date of request):

Date of site inspection completed:

Findings:

Conditions:

Revision Outcome	☐ Approved	☐ Rejected
Permit ID		
Version		
Permit Validity/Expiration Date		

FLORA AND FAUNA

ENVIRONMENTAL MANAGEMENT PLAN

FOR

MAUD CREEK PROJECT AREA

[2022-2025]

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ABBREVIATIONS

TABLE 1 ABBREVIATIONS

Acronym	Description
AS	Australian Standards
DEPWS	Department of Environment, Parks and Water Security
DITT	Department of Industry, Tourism and Trade
EMP	Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
KPI	Key Performance Indicators
MCPA	Maud Creek Project Area
MMP	Mining Management Plan
NTMO	Northern Territory Mining Operations
SOP	Standard Operating Procedure
TPWC Act	*Territory Parks and Wildlife Conservation 2001*
RACI	Responsible, Accountable, Consulted and Informed
SMART	Specific, Measurable, Achievable, Relevant and Timely

1 SCOPE

This *Flora and Fauna Environmental Management Plan* applies to all personnel and work activities conducted under the direction of Northern Territory Mining Operations (NTMO) at the Maud Creek site.

The nature and scope of activities conducted at Maud Creek are similar to other care and maintenance NTMO sites however this plan manages hazards associated at the Maud Creek Project Area.

2 PURPOSE

The purpose of this plan is to ensure that appropriate controls are developed and implemented to effectively protect flora and fauna at Maud Creek.

This document provides an overarching plan for the coordination and strategic management of effort.

3 CONTEXT

The NTMO policy requires the undertaking of business in a manner that minimises any potential environmental impacts.

Day-to-day management is implemented through the procedures and plans across each of the NTMO operations. This plan aims to integrate and coordinate existing resources into a coordinated approach.

4 AIM

The intention of this management plan is to provide advice to:

- Continue to gather information on the flora and fauna that inhabit the area;
- manage areas of disturbance to flora and fauna through the Permit to Clear system; and
- promote awareness of protection of flora and fauna.

5 LEGAL AND OTHER REQUIREMENTS

5.1 Legislation

Applicable legislation to flora and fauna management at the site includes:

- *Mining Management Act;*
- *Aboriginal and Torres Strait Island Heritage Protection Act 1984;*
- *Environment Protection and Biodiversity Conservation Act 1999;*
- *Bushfires Act;*
- *Environmental Offences and Penalties Act;*
- *Heritage Conservation Act;*
- *National Environment Protection Council (Northern Territory) Act;*
- *Territory Parks and Wildlife Conservation Act;* and
- *Weed Management Act*.

5.2 Guidelines

Land Clearing Guidelines D.I.T.T

5.3 NTMO Standard Operating Procedures

NTMO Standard Operating Procedures (SOP) applicable to flora and fauna management within the project area includes:

- NTMO ES – SOP 11 Fauna Monitoring;
- NTMO ES – SOP 15 Weed Spraying;
- NTMO ES – SOP 23 Snake Capture and Relocation;
- NTMO ES – SOP 28 Ground Disturbance (Permit to clear);
- NTMO ES – SOP 30 Weed Control;
- NTMO ES – SOP 31 Incidents and Notification Reporting;
- NTMO ES – SOP 32 Pest and Vector Management;
- NTMO ES – SOP 33 Fauna Injury and Death Management; and
- NTMO ES – SOP 34 Feral Animal Management.

5.4 Approval Conditions

The following approvals may be applicable:

- Maud Creek MMP (2013).
- Mud Creek MMP (2022-2025)

6 OPERATIONAL STATUS

6.1 Activities

The MCPA is in a care and maintenance phase with no mining or processing activities undertaken at this site. Should any activities occur at the project area which would cause ground disturbance, an NTMO Clearing Permit would be required. From this process items with heritage or flora/fauna significance should be identified. Where any exploration activities are to occur at Maud Creek a separate Exploration MMP will be submitted to the Department.

Care & maintenance activities could include the following:

- Weed mapping;
- land management (maintaining roads, hazard reduction burning, weed control, sediment and erosion control);
- environmental monitoring (flora and fauna, surface and groundwater, heritage, sediment and waste rock); and
- safety and environmental site inspections.

7 OBJECTIVES AND TARGETS

The NTMO strategic objectives for managing flora and fauna at the site is to continue to gather information and prevent disturbance.

NTMO have set three key targets to drive and measure performance towards achieving the overarching strategy/objective. These targets are defined in Table 2. As part of continual improvement, NTMO reviews and assesses performance against these targets. A review and status of environmental performance against these targets are provided to Department of Industry, Tourism and Trade in the Operational Performance Report (OPR) and/or Mining Management Plan (MMP).

NTMO considers the Specific, Measurable, Achievable, Relevant and Timely (SMART) method when considering annual objectives and targets.

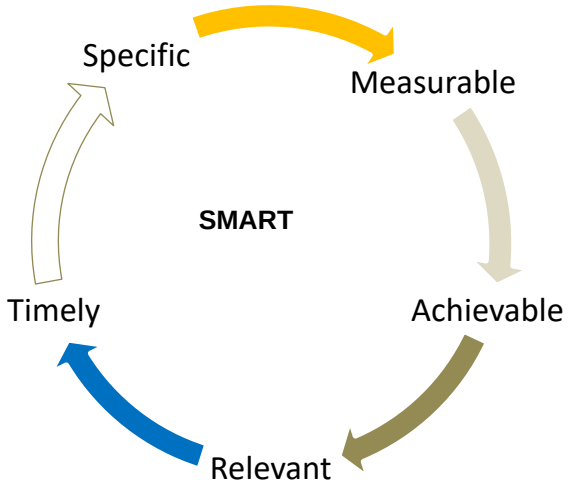

FIGURE 1 SMART METHOD FOR DETERMINING OBJECTIVES

Further detail regarding NTMO objectives and targets for 2022-2025 is provided in Table 2.

8 MEASURING AND MONITORING

NTMO has reviewed the previous reporting periods objectives and targets and have provided a discussion and analysis of results and corrective actions required in the 2022-MMP. The following management strategies presents the objectives and targets for the 2022-2025 period (Table 1).

Table 2 FLORA AND FAUNA MANAGEMENT PROCEDURE

Specific			Measurable		Achievable	Timely	Relevant	
Strategic Objective (What)	Actions (How)	Explanation (Why)	Timeframe (When)	Responsibility (Who)	Target	Target Date	Key Performance Indicators	Non Conformance and Corrective Action
Review the fauna sightings register.	Continue logging and reviewing fauna sightings.	To develop improved management of fauna species and abundance at the site.	Review database Annually. Continued logging of fauna sightings of note for the life of this EMP.	Environmental Officer	Fauna sightings register with log entries.	Annually	Fauna sightings database and entries of fauna sightings (if applicable).	Conduct a retrospective review of fauna sightings register to identify any trends in fauna populations.
Avoid areas of flora and fauna significance.	Obtain Permit to Clear approval prior to any ground disturbance activities and rehabilitate exploration locations in accordance with NTMO SOPs.	To minimise impact to native flora and fauna in the project area.	Permit to Clear Approvals as required.	Environmental Officer	Approved Permits to Clear as required. Photographs taken before and after rehabilitation. Rehabilitate cleared areas as soon as possible.	Annually	Permit to Clear approval obtained No adverse impact to flora and fauna identified.	If areas of flora and fauna significance are impacted an assessment will be undertaken to determine the level of impact and remediation activities undertaken as necessary.
Implement measures to protect and appropriately manage any threatened species observed to inhabit the vicinity of the project area.	To be determined based upon any sightings of threatened species.	Protect threatened species.	Prior to any additional exploration drilling (other than currently proposed) or mining.	Environmental Officer	To be determined based upon any sightings of threatened species.	Annually	Review of fauna sightings register, implementation of protection methods if identified to be a risk of impact from operations.	Review of protection measures or implementation methods. Develop alternative solutions.

9 ROLES AND RESPONSIBILITIES

Roles and responsibilities are set out in the following Responsible, Accountable, Consulted and Informed (RACI) matrix.

Table 3 ACCOUNTABILITY MATRIX

Task Description	Employees & Contractors	Environmental Officers	Environment & Community Manager	Health & Safety Manager	General Manager	All Managers
Understand and apply all required procedures and systems in regards to native flora and fauna management	R		A			
Report any non-compliance with the native flora and fauna management requirements through the event/incident reporting system	R					A
Sign off on ground clearance approvals as required by the system and in accordance with the approved ground clearance		R	A			
Ensure all employees and contractors are aware of all required procedures and systems for native flora and fauna management and are provided with all required resources to implement the requirements effectively;			R		A	
Ensure all employees and contractors are provided with appropriate clearance approvals and on-ground guidance prior to giving any native vegetation clearing instructions;	I	R	A			
Ensure all employees and contractors are provided with appropriate flora and fauna management related training	I		R	C	A	
Undertake annual review of the Flora and Fauna EMP		R	A		I	

Key:

R	Responsible	Person working on activity
A	Accountable	Person with decision authority, ultimately responsible of failure
C	Consult	Key stakeholder who should be including in decision
I	Inform	Person that needs to know of decision/action/outcome

10 DISCUSSION, ANALYSIS AND REPORTING

10.1 Reporting of results & non-compliances

NTMO has provided performance assessment against the EMPs and MMP commitments/requirements for the period (2021) within the MMP 2020. A copy of the fauna sightings register has also been included in the MMP 2020. Any non-compliance found in this performance assessment is discussed, analysed with corrective and preventative actions identified therein.

10.2 Incident Reporting

Where a flora and fauna related incident, causes or threatens to cause material[1] or serious[2] environmental harm, on and offsite the Northern Territory DITT will be informed as soon as practicable in accordance with the *Mining Management Act*. As a minimum, NTMO internal policy prescribes reporting within 12 hours and submission of a Section 29 report to DITT within 24 hours. For all environmental incidents offsite the Northern Territory Department of Environment, Parks and Water Security (DEPWS) will be informed as soon as practicable (and in any case within 24 hours after) as per the *Waste Management and Pollution Control Act 1998*.

Reporting of incidents and non-compliances will be undertaken in accordance with the NTMO ES – SOP31 Incidents and Notification Reporting and in the OPR and/or MMP.

The occurrence of new declared weeds in the project area will be reported as per the *Weed Management Act* and to DITT as per the *Mining Management Act*.

[1] Where material environmental harm is defined as 'environmental harm that is not trivial or negligible in nature, consists of an environmental nuisance of a high impact or on a wide scale, results, or is likely to result, in not more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of not more than $50,000 or the prescribed amount (whichever is greater).

[2] Where serious environmental harm is defined as 'environmental harm that is more serious than material environmental harm and includes environmental harm that is irreversible or otherwise of a high impact or on a wide scale, damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance, results or is likely to result in more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of more than $50,000 or the prescribed amount (whichever is greater).

11 REVIEW

The Flora and Fauna EMP will be reviewed and updated no later than annually. A review may occur sooner consequent to a material change in risk, legal requirements, or an incident relevant to waste management.

12 REFERENCES

Waste Management and Pollution Control Act 1998.

Weed Management Act

Mining Management Act

NSR Environmental Consultants Pty Ltd, 1995. *Draft Environmental Impact Statement*. July 1995. (Supplement August 1995).

Wilson BA, Brocklehurst PS, Clark MJ and Dickinson JJM., 1990. *Vegetation of the Northern Territory*, Australia. Technical Report No. 49. Conservation Commission of the Northern Territory, Darwin.

NTMO URPA Fire Prevention EMP

NTMO ES –SOP33 Controlled burning

NTMO ES – SOP33 Fauna injury and death management

NTMO-ES – SOP11 Fauna monitoring

NTMO ES-SOP23 Snake capture and relocation

NTMO ES – SOP 28 Ground disturbance

NTMO ES – SOP31 Incident & Complaint Notification & Reporting

URS Australia Pty Ltd, 2008. *Maud Creek Gold Mine Underground Mine Project Environmental Impact Statement*. Dated February 2008.

SIGNIFICANT SPECIES MANAGEMENT PLAN AND FAUNA HANDLING PROCEDURE

FOR

MAUD CREEK EXPLORATION ACTIVITIES

NTMO Environment Department

[2022-2025]

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1 SCOPE

This Significant Species Management Plan has been developed to detail he management and handling of fauna during all pre-clearing, clearing and drilling activities associated with the Maud Creek exploration projects.

2 PURPOSE

To reduce the risk of harm or injury to fauna during clearing of woodland vegetation and any other areas of fauna habitat, as well as the safe handling and removal of any stock or wildlife that may be injured or trapped in open sumps or other excavated areas.

3 CONTEXT

The EPBC Act focuses the Australian Government interests on the protection of Matters of National Environmental Significance (MNES), with the states and territories having responsibility for matters of State and Local significance. Under the EPBC Act there are eight MNES, including:

World heritage properties;

National heritage places;

Wetlands of international importance (listed under the Ramsar Convention);

Listed threatened species and ecological communities;

Commonwealth marine areas;

the Great Barrier Reef Marine Park; and

nuclear actions (including uranium mines).

Conditions described in EPBC 2008/4096 include:

- 8 (ii) use of sequential clearing to direct fauna away from an impact zone; and
- 8 (iv) welfare and safe handling of fauna specimens requiring relocation from impact sites.

4 Responsibilities of Key Personnel

Table 1 The following table provides details of the roles and responsibilities of key personnel

POSITION	RESPONSIBILITIES
Project Manager (PM)	• Ensuring that the Fauna Handling Procedure is issued, approved and communicated; and • Ensuring adequate human and financial resources, organisational means and proper assets for the effective implementation of this Procedure are provided.
Environmental Superintendent (EM)	• Responsible for overseeing the implementation of the Significant Species Management Plan during the life of the Maud Creek Exploration Project; • Ensuring sufficient resources and appropriately licensed suitably qualified experienced persons are involved in fauna handling;

	• Ensuring that Fauna Handling Procedure are issued and up-to-date; • Communicating with authorities (such as DITT), The Company and the Client; and • Ensuring that staff and subcontractors on site are aware of the Fauna Handling Procedure.
Health, Safety & Security Manager	• Ensuring that First Aid Boxes are available at each work area; • Ensuring staff are adequately trained in First Aid procedures and are aware for specific treatments for venomous animal bites; • Ensuring that First Aid procedures for fauna bites in the Health and Safety Management Plan are up-to-date; and • Ensuring all staff are aware of emergency procedures for life threatening injuries and bites.
Environmental Officers (EO)	• Fauna identification, capture, handling and relocation of all fauna species (including venomous snakes); • Identification of tracks, scats, burrows, nests and other fauna habitat of conservation significant species; • Assessing injured fauna for suitability for release and temporary care; • Familiarity with the ecology of all species that may be encountered in order to be able to appropriately translocate fauna encountered; • Relocating healthy fauna back into a similar habitat; • Organising the appropriate action to take any injured fauna to designated wildlife carer group or veterinarian; • Ensure all First Aid kits are identified, have a full inventory and are inspected as scheduled; • Ensure Fauna Incident Reporting and notification to DITT in a timely manner; • Reviewing Fauna Interactions Register and Fauna Handling Reports-Injury/Death Form/s weekly to compile weekly feedback to management; and • Contacting the designated wildlife carer group or veterinarian to make arrangements for injured fauna to be received and treated.

5 Operator Self-Assessment of the Environmental Risk

Table 2 Likelihood Analysis based on Submitted MMP Section 2 Environmental Consideration

Description	Yes or No	Analysis			Current control
		Likelihood	Consequence	Risk Rating	
Are there Threatened Flora species that may occur in the proposed work area	No	Rare	Low	Low	Clearing permit
Are thereThreatened Fauna species or habitats of significance that may occur in the proposed work area?	Yes	Possible	Moderate	Moderate	Total disturbed area (0.83ha) <5ha Less than four different obligate species for each disturbed area Detailed control refers to Section 6 Operation Controls
Are there any known declared weeds within the proposed work area?	Yes	Possible	Low	Moderate	Routine weed spray
Will you be using water from bores for the operation?	No	Rare	Low	Low	Using other sources
Will you be using water from other sources for the operation?	Yes	Unlikely	Low	Low	Surface water quality monitoring of Maud Creek pit
Is your project likely to have a significant impact on the environment?	No	Unlikely	Low	Low	No significant impact has been identified with appropriate

		Consequence				
		Negligible	Low	Moderate	High	Extreme
Likelihood	Almost certain	Moderate	Moderate	High	Extreme	Extreme
	Likely	Low	Moderate	High	High	Extreme
	Possible	Low	Moderate	Moderate	High	Extreme
	Unlikely	Low	Low	Moderate	High	High
	Rare	Low	Low	Moderate	Moderate	High

6 OPERATIONAL CONTROLS

6.1 Fauna Habitat Surveys

Fauna habitat surveys shall be conducted prior to any vegetation clearing activities. The purpose of these surveys is to identify and flag any habitat (such as tree hollows, termitaria [hollow arboreal termite mounds], stick nests, burrows, etc) and any areas of high fauna utilization (e.g high number of sightings, scratches or scats) that are within the proposed clearing drill pads. This survey is to be conducted no longer that **40 days** prior to construction.

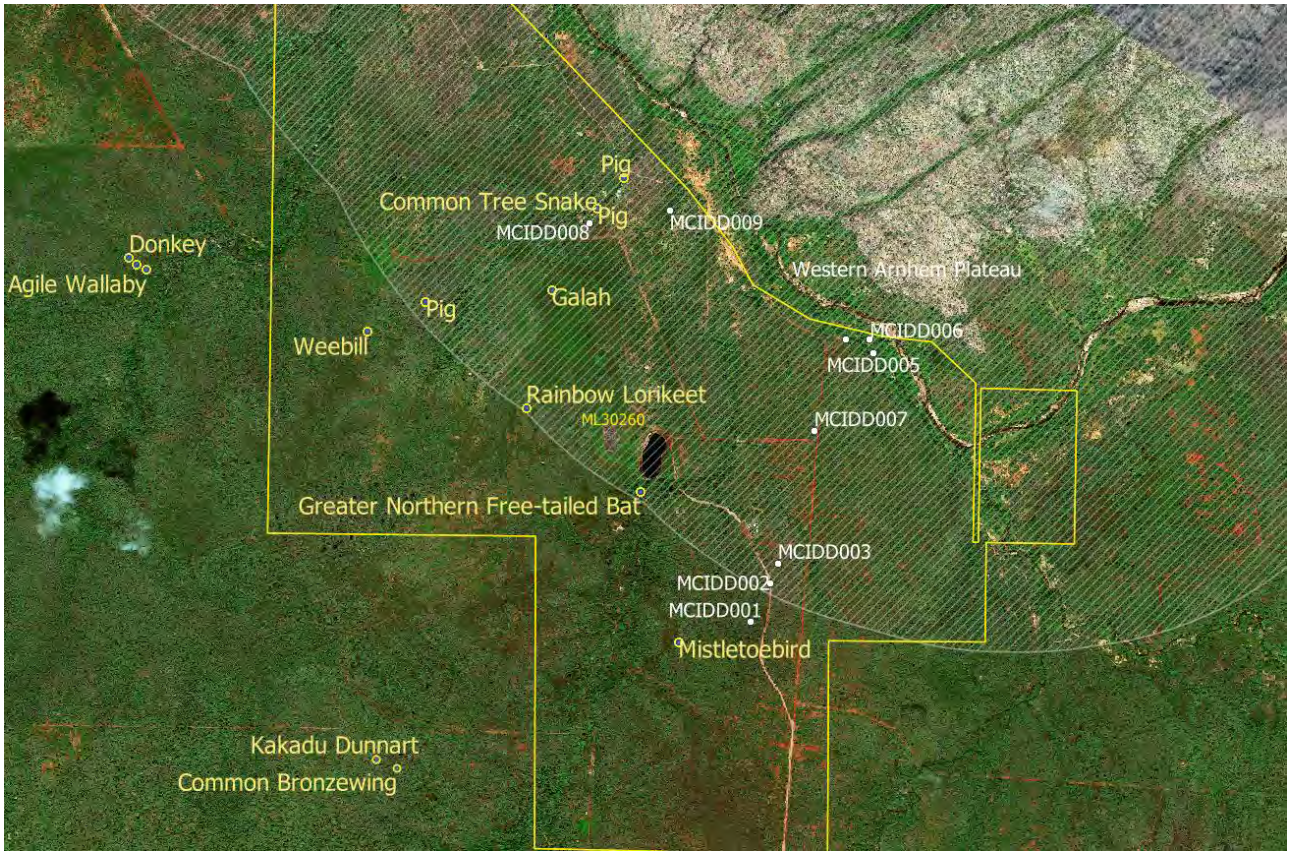

Figure 1 Significant and Threatened Fauna (NR GIS Data) close to Maud Creek Drill Pads

The purpose of this survey is to quantify the extent of habitat embellishments (i.e. nest boxes) that are required to offset the displaced fauna, and the appropriate locations for installation. All active and inactive fauna habitat should be recorded by hand-held GPS and flagged with flagging tape.

A second round survey will be associated with the clearing fronts. NTMO environmental officer is required to walk the entire area prior to vegetation clearing. Data should be available to drilling team so they are aware of fauna sensitive areas.

- Before areas are cleared, they need to be properly marked on site to indicate clearing limits and prevent unauthorised removal of vegetation or disturbance to potential nest areas. Ensure all permits and approvals must have been granted and a copy of all documentation is available on site.
- Ensure all vegetation is cleared in a sequential manner and in a way that directs escaping wildlife away from the clearing activities and into adjacent natural areas.

- Where possible, clearing around hollow bearing trees will be conducted first; if connecting canopy trees can be retained to allow fauna to escape, delay the clearing of those trees as long as possible.
- Try to avoid double-handling stockpiled vegetation; fauna will start using it as shelter and potentially nesting grounds specially if not used for extended periods of time.
- Ensure all fauna sensitive areas marked as “No-go zones” are maintained and no disturbance is conducted in them.
- Where working within Environmentally Sensitive Areas and identified areas where threatened species are located, the size of the drill pads shall be reduced or relocated.
- Please ensure to maintain a maximum speed of 25 Kmph in areas of high value habitat.
- It is not allowed to feed any animals within the Project area and while conducting project-related activities.
- No barbed wire will be used for fencing unless it’s a specific requirement from the landowner of a particular area. In this situation, the wire must have visual aids (such as high-vis bunting) to ensure the wire is visible to native fauna.
- Steep bund should be avoided. The bund must be less than 45 degree angle for Fauna escape purposes.
- Gaps must be left between pipes to allow fauna movements across the line of the pipe.
- Ensure all waste is disposed of appropriately and no plastic bags/containers are left in any areas.

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6.2 Hollow Removal and Relocation by Suitably Qualified Fauna Handlers

From data and information collected during the fauna habitat survey within the key fauna sensitive areas, fauna load reduction zones will be identified. The fauna reduction will be predominately focus on arboreal mammals due to the ability to relocate their habitat. Within these areas, fauna will be removed by either plugging them within their hollow or trapped then released. In addition to physical removal of fauna, hollows (occupied and unoccupied) will be removed and relocated to nominated areas outside the drill pads to discourage fauna from returning to the clearing pads.

Due to fauna behaviours and habitat requirements for a number of fauna species, it is not possible or viable to remove and relocate all fauna habitat, for example leaf litter. It is anticipated that most ground dwelling fauna will vacate the area once disturbance and vibrations commence. It is known that it is more difficult for arboreal animals to vacate an area, therefore these species are being focused on. Nevertheless, areas of high habitat value, especially associated with records of threatened species, will be identified and flagged prior to clearing works commencing.

Fauna load reduction and removal of habitat will not result in an area being free from fauna, however it is considered that fauna numbers will be minimised. All significant fauna habitat relocation is to be managed by qualified fauna handers utilising correct handling techniques.

6.3 Sump Inspections

The purpose of these inspections is to search for any fauna that may be trapped inside the sump. Site workers shall be looking for direct observations in addition to indirect observations, such as new scats or tracks within the sump.

It is to be noted that the frequency of sump inspections is dependent upon weather conditions. The site environmental officer will be responsible for providing guidance and making the decision as to when additional inspections are to be conducted.

When an animal is noted as trapped within the working area, work must be immediately ceased and the site supervisor notified. Environmental department should be immediately engaged to assess the situation and together ascertain the best approach to remove the fauna. No operations will commence or continue until the fauna has been removed from danger.

6.4 Fauna Condition Assessment

For any fauna captured during the project, the fauna handler shall conduct a rapid assessment to determine the state of health and/or any injury to the animal. The possible outcomes of the assessment are that the animal:

1. Is fit for immediate release-the animal will be released at an appropriate time and location by the fauna handler;
2. The animal requires minor rehabilitation- the animal will be treated with basic first aid by the Fauna Handler, will be held until checked by vet nurse;
3. Is appropriate for long term rehabilitation and release-rehabilitation should be conducted by a registered Wildlife Carer;or
4. Would not survive without surgery that would prevent its re-entry into the wild-the fauna must be first inspected by a trained professional, such as an experienced wildlife vet nurse, then either send to a Wildlife Care for long term rehabilitation or humanely euthanised; or
5. Is so badly injured that it cannot survie- Wildlife Carer will make this decision

6.5 Management of Fauna Release

Once an animal is deemed fit for release, the Fauna Handler is responsible for returning the animal to the appropriate area. When releasing an animal, attention must be paid to a number of factors, including proximity to operational construction activities, weather conditions, seasonal conditions and the animal's ecology. In particularly, the animal should be released:

1. Away from any construction activities;
2. Into a suitable habitat with adequate food supply;
3. In appropriate weather, season and time of day (this is particularly important for migratory species);
4. Under circumstances which will not cause additional stress, such as extremes of weather, the wrong time of the day;
5. In the appropriate social group. Some animals fare better if released into social groups; and
6. Within 1km of the capture location, as per legislation and landowner agreement.

6.6 Fauna Notification and Reporting

All vertebrate fauna species encountered during the pre-clearing, construction and operational works will be recorded in the Fauna Interaction Register. This register will also contain a separate section highlighting threatened species that have been handled.

Table 3 Fauna Interaction Register

FAUNA INTERACTIONS REGISTER					
FAUNA HANDLER'S INFORMATION:					
Name of Fauna Handler/s :_____			Date of Fauna Handling:_____		
Telephone Number:_____			Time:_____ am/pm		
Email:_____			GPS location/s : _____		
Signature:_____					
FAUNA INFORMATION:					
No.	Fauna Type	Genus & species (if known)	If Unknown, brief description & photo attached	Significant / Threatened Species (Y/N)	Where was fauna relocated?

Table 4 Fauna Incident Report – Injury/Death Form

Fauna Incident Report – Injury/Death Form
FAUNA HANDLER'S INFORMATION: Name of Fauna Handler :_____ Date of Injury /Death:_____ Telephone Number:_____ Time:_____ am/pm Email:_____ GPS location : _____ Signature:_____
FAUNA INFORMATION: Fauna type: _____ Genus/species known : _____ Significant species (Y/N) : _____ Brief description of fauna (size, weight etc):
INJURY TO FAUNA: What was the cause of injury? _____ Brief description of extent of injury: The vet/wildlife carer the fauna was taken to: _____ The vet/wildlife carer's prognosis: _____
DEATH OF FAUNA: What was the cause of death? Brief description of extent of injury that resulted in death: How was it disposed of?
NOTIFICATION: Date/Time NTMO Environmental Personnel Notified: _____/_____ Person Contacted: _____ Notes: _____

Was any government agency notified? Yes / No If yes, provide name, agency, contact info:
Measures to Prevent Recurrence of such an incident:

Maud Creek Targeted Survey
Terrestrial and Aquatic Ecology
2018 - 2019

Prepared for

KL | KIRKLAND LAKE GOLD

Revision 1
February 2020

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Version Revision 1

Date of Issue February 2020

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This report was prepared between October 2018 and February 2020 and is based on data reviewed and information compiled during field surveys undertaken during 2018 and 2019. EcoScience NT/Ecological Management Services Pty Ltd disclaim any responsibility for any changes that have occurred after this time.

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Document History

Revision	Date	Author	Reviewer
1	22 February 2020	P. Barden/K. Metcalfe	

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APPENDIX 2 TERRESTRIAL FAUNA OF THE MAUD CREEK MINE AREA – COMBINED RECORDS

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ABBREVIATIONS

AOLA	Atlas of Living Australia
CAMBA	China Australia Migratory Bird Agreement
DEE	Commonwealth Department of Environment and Energy
DENR	Northern Territory Department of Environment and Natural Resources
DIPE	Northern Territory Department of Infrastructure, Planning and Environment
DLRM	Northern Territory Department of Land and Resource Management
DSEWPC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts
EIS	Environmental Impact Statement
EMS	Ecological Management Services Pty Ltd
EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
HDM	Hollingsworth Dames and Moore Pty Ltd
JAMBA	Japan Australian Migratory Bird Agreement
KLG	Kirkland Lake Gold
NRETA	Northern Territory Department of Natural Resources, Environment and the Arts
NT	Northern Territory
NTMO	Northern Territory Mining Operations Pty Ltd
MNES	Matters of National Environmental Significance
TPWC	Northern Territory *Parks and Wildlife Conservation Act 1976*
VMU	Vegetation Mapping Unit

EXECUTIVE SUMMARY

Background and Scope

Kirkland Lake Gold acquired the Maud Creek goldfields in 2016 and proposes to construct an underground mine located wholly within ML 30260. It is anticipated that the NTEPA will require environmental assessment for the proposed mine under an EIS pathway and in preparation for this KL Gold have been conducting a series of investigations including the current review of existing information on aquatic and terrestrial flora and fauna. This report presents updated ecological information from the Maud Creek study area with particular focus on flora and fauna of conservation significance, providing a comprehensive review of existing information.

Methods

Flora methods used for this survey are in accordance with those recommended for Vegetation Survey and Mapping by the Northern Territory Government, Department of Natural Resources, Environment and the Arts (NRETA, 2007). Consistent with national standards of the National Vegetation Information System (NVIS), vegetation assessment was based on the collection of full floristic and structural information within 20 m x 20 m study plots. Targeted and random searches were conducted within the study area for significant flora. Incidental records of introduced species were recorded during all field surveys. At 39 new flora check sites species, species dominance was determined for vegetation mapping as well as estimates of cover and average height for upper, mid and lower stratum vegetation.

Results

A substantial amount of information on flora and vegetation has been collected from the study area during the last 13 years. Recent surveys conducted as part of the Northern Territory Government's Mapping the Future Project have focussed on the greater Katherine region including Maud Creek station as one of five priority regions to be studied in the Top End. Ongoing DENR surveys during the 2019-2020 wet season will provide further information including detailed vegetation mapping of the greater Katherine region.

The current flora survey focussed on the 1,272 ha study area that encompasses the Maud Creek gold deposit and provides habitat mapping and a revised vegetation map. This report provides information on weed diversity and distribution and compiles a review of all recent data and information on flora with particular focus on significant flora.

Habitat Mapping

Five main habitat types were mapped within the study extent with nine different habitat units occurring within the study area. The main habitats comprise hills and rises, extensive alluvial plains which are dissected by drainage features, and minor areas of limestone plains and rises. Two habitats known to support species of conservation significance - including sandstone plateau of the Arnhem system and well-developed limestone outcrop of the Tindal system - do not occur within the 1,272 ha study area, which encloses the proposed project footprint. However, both habitats occur in close proximity to the study area and there is potential for impacts on species of conservation

significance known to occur in these areas should future plans involve expansion of the current development envelope or changes to the access road alignment.

Vegetation Mapping

The predominantly flat to gently undulating study area supports extensive low woodland to open woodland with smaller patches of mid-high woodland along drainage lines and on deeper, well drained soils. The 10 vegetation mapping units stratified within the study area are characteristically dominated by Corymbia and Eucalyptus species, which generally have a wide distribution within the region. No significant ecological communities or sensitive vegetation occurs within the project footprint. None of the vegetation types within the study area have a restricted distribution but one vegetation type (VMU2b), dominated by the endemic *Eucalyptus distans* (Katherine box), only occurs within the Top End of the Northern Territory with two other small disjunct populations in Western Australia and Queensland. Approximately 96 ha of the study area has previously been cleared for pastoral development and mining activities.

Flora

All surveys conducted to date within the 1,272 ha Maud Creek study area have detected at total of 322 species of vascular plant drawing from 58 different families (Appendix 1.2). The combined results of all database searches, NTG records and the findings of this survey for the wider (459 km^2) study extent revealed a total of 2,495 flora records, for 575 flora species from 82 different families.

Threatened species. No plant species listed as threatened (endangered, vulnerable or near threatened) under the Commonwealth *EPBC Act* have been recorded from within the Maud Creek study area, nor from within the wider study extent. Combined data from all data bases and surveys conducted to date indicates that eight plant species listed as significant under the Northern Territory *TPWC Act* have been recorded within the study extent, with two significant plant species known to occur with the study area. The two significant plants recorded within the study area (*Phyllanthus lacerosu*s and *Tephrosia humifusa*) are classified as either data deficient (DD) or near threatened (NT) respectively under NT legislation. Near Threatened taxa are not yet classified as threatened, and exist either as small fragmented populations, or occur in populations thought to be in decline.

Fifteen endemic plant species are known from the study extent with 10 endemic species recorded within the current study area (Appendix 2.1). All other native plant species recorded are listed as least concern (LC), are considered to be widespread and abundant with healthy populations that are not in decline and therefore of minor conservation significance.

Grass species that constitute important food sources for gouldian finches (primarily *Alloteropsis semialata* and to a lesser extent *Chrysopogon fallax*) were detected within the study area during a targeted wet season survey in January 2019. *A. semialata* was recorded at four locations within 2 km of the previous mine, typically in patch sizes exceeding 50 m x 100 m often in association with *Themeda triandra* and *Cynodon* sp. Heavy grazing appears to have had a local reduction in the distribution and abundance of Gouldian finch food plants with the highest density in ungrazed paddocks in the NE corner of the study area.

Weeds

A total of 22 exotic species were recorded during the 2018-2019 vegetation assessment survey of a grand total of 31 weeds recorded during all surveys conducted within the study area. Recent field surveys detected one class A species (*Andropogon gayanus* or Gamba grass) which is also a weed of national significance (WONS) and eight class B species declared under the Northern Territory Weed Management Act (2001) indicating that the land owner must make a reasonable attempt to control existing infestations and prevent their spread. Class B weeds recorded in the study area included *Calotropis procera* (rubber bush), *Senna obtusifolia* (sicklepod), *Mesosphaerum suaveolens* (hyptis), *Sida acuta* (spinyhead sida), *Sida cordifolia, Sida rhombifolia* (Paddy's lucerne)*, Azardirachta indica* (Neem tree), and *Cenchrus polystachios* (perennial mission grass). The remainder are environmental weeds, which do not have declared status under the Weeds Management Act 2001. Hyptis was the most widespread and abundant weed, comprising 57% of all weed records. This species occurred in all habitats within the study area, often in very dense stands. A potentially invasive species elephant grass (*Pennisetum purpureum*) was recorded approximately 3 km south of the old mine. Listed as an invasive species in the USA and Pacific Islands *P. purpureum* is native to Africa, forms robust clumps up to 7.5 m high and its potential spread should be closely monitored.

Terrestrial Fauna

Camera trapping within the Maud Creek study area recorded approximately 61,500 trigger events, with wildlife or stock identifiable in 23.3% of the trigger events. Camera traps recorded 24 vertebrate species, including three amphibian, three reptile, seven bird and eleven mammal species.

A total of 77 bird species were detected in woodland bird surveys conducted within the study area during the 2018 and 2019 surveys. None of the birds detected during the 2018-2019 woodland bird surveys are listed as threatened under Northern Territory or Commonwealth legislation. Four bird species listed as near threatened under Northern Territory legislation were recorded.

Call broadcast surveys conducted for the northern crested shrike tit (vulnerable, EPBC) and northern masked owl (vulnerable, EPBC) failed to detect these species within the study area.

A single ghost bat (vulnerable, *EPBC Act 1999*) was found impaled on a boundary fence within the study area in May 2018

Aquatic Fauna

A total of seventeen freshwater fishes have been recorded within the study area and adjacent habitats on Maud Creek during the current and previous assessments. Previous surveys, review of existing data and EPBC protected matters reports have not identified threatened or significant freshwater fish species in the study area or adjacent areas of Maud Creek.

During the 2018 aquatic macroinvertebrate sampling period, a total of 42 family level or higher order groups (89 individual taxa) were recorded in edge and riffle samples. Macroinvertebrate taxa diversity was slightly higher in 2018 when compared to sampling conducted in 2007.

Modelling to identify important habitat factors influencing macroinvertebrate community structure indicated that levels of disturbance by cattle and other feral animals was the most important habitat variable. Important water chemistry parameters influencing macroinvertebrate composition between

sites based on linear modelling included surface water salinity and sulphate related measures and pH. These parameters are likely to indicate variation between conditions in Gold Creek and sites on the main Maud Creek channel.

Significant Fauna Species

Several EPBC and TPWC Act listed threatened species have been detected within or in the area surrounding the Maud Creek mining lease area.

Ten species listed as near threatened in NT government legislation (TPWC Act 1976) have been recorded within the Maud Creek lease during current or recent (2007) surveys or historical surveys.

Impacts

The following project related factors may impact biodiversity values and threatened/significant species:

- Habitat clearance;
- Habitat fragmentation;
- Dewatering of shaft;
- Contaminated run-off and ground water;
- Draw-down of water tables;
- Erosion and sedimentation;
- Weeds and pests;
- Altered fire regimes;
- Collisions with vehicles (wildlife);
- Light and noise; and
- Dust.

Ecological surveys and a review of existing data indicate that several significant fauna species (EPBC Act 1999 and TPWC Act 2000 listed threatened and near threatened) occur within the study area, requiring specific management and monitoring measures. Significant species within the Maud Creek lease or adjacent areas include:

- Endangered (EPBC Act) species (Gouldian finch).
- Vulnerable (EPBC Act) species (red goshawk, ghost bat).
- Vulnerable (TPWC Act) species (Mertens' water monitor).
- Near threatened (TPWC Act) species (Australian bustard, bush stone-curlew, hooded parrot, square-tailed kite, northern brown bandicoot, northern brushtail possum, orange diamond-faced bat, Arnhem sheath-tailed bat, northern nailtail wallaby and western chestnut mouse).
- Potential presence of near threatened (TPWC Act) flora species (Tephrosia humifusa).
- Potential presence of data deficient (TPWC Act) flora species (Phyllanthus lacerosus).

1.0 INTRODUCTION

EcoScience NT and Ecological Management Services Pty Ltd were commissioned by Northern Territory Mining Operations Pty Ltd (NTMO), a company owned by Kirkland Lake God (KLG), to provide an update on the terrestrial and aquatic ecology of the Maud Creek Gold Mine area within ML 30260. The study area is located within the Maud Creek South Station, approximately 280 km south-east of Darwin and 20 km south-east of Katherine (Figure 1). NTMO intends to mine gold at Maud Creek within the main deposit which is located wholly within tenement ML 30260. As the current proposal involves an underground mine with ore hauled to Union Reefs for processing along the existing access road alignment, the project footprint will be contained within ML 30260.

In this report the 'study area' refers to the central section of ML 30260 where mining is proposed and includes an area of approximately 1,100 hectares of undulating lowland country containing a range of habitats, including alluvial plains, sandy riverine corridors and low rocky rises (Figure 3). The majority of the study area has a long history of intense cattle and water buffalo grazing which has substantially impacted habitat quality, resulting in extensive erosion, degraded drainage lines, weed invasion and altered vegetation structure.

During this review, ecological data and information on threatened species was assessed from an area exceeding the proposed mining area (study area), referred to in this report as the regional 'study extent'. The Maud Creek study extent includes approximately 459 km^2 extending from the Katherine River south to the boundary of King River station, bordered by the Stuart Highway to the west and the escarpment of Nitmiluk National Park to the east (Figure 1).

1.1 OBJECTIVES

The Maud Creek area has been the subject of a number of previous environmental studies focussing on terrestrial and aquatic biota. The current terrestrial and aquatic ecology assessment was designed to update ecological data for the study area. The objective of the study was to review existing data and conduct additional targeted assessments to provide current information regarding the ecological condition of the study area and determine the presence of listed threatened and migratory terrestrial species. The objectives/study approach included:

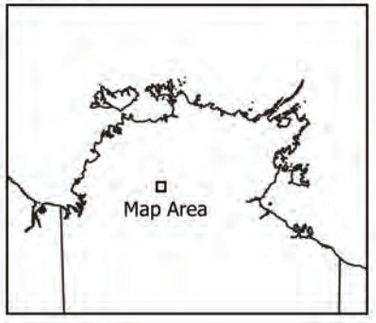
- Database searches to refine lists of fauna and flora species known to occur or potentially occurring in the study area, particularly in reference to listed significant species of conservation significance;

- An updated literature review to obtain any new, background or historical information on the terrestrial and aquatic ecology of the study area focussing on threatened and significant flora and fauna species;
- Identification of all listed threatened and migratory species that could occur within or utilise the study area and could therefore be impacted by the proposed underground mine;
- Conduct additional targeted field verification surveys, including quantitative and opportunistic sampling in the proposed mining area, focussing on unresolved issues relating to threatened and migratory vertebrate fauna species;
- Compilation of habitat mapping for the Maud Creek study area;
- Field assessment of the study area for the presence of threatened flora or plant communities of conservation significance including plant species and communities listed under Commonwealth (EPBC) or Northern Territory (TPWC) legislation.;
- Additional floristic surveys within and adjacent to, the proposed project footprint using standard quantitative techniques;
- Review and update vegetation mapping based on all recent flora studies within the Maud Creek study area;
- Conduct a survey of distribution, diversity and abundance of weed species, update weed mapping and discuss weed management issues for the study area;
- Assessment of terrestrial flora and fauna species and terrestrial and aquatic habitats determined to be of conservation significance under relevant legislation that may potentially be impacted by the proposed project.

Figure 1. Maud Creek Study Area

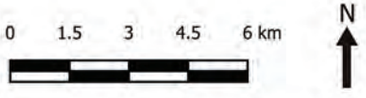
Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



Legend

- Maud Creek Study Area (ML)
- Maud Creek Study Extent
- National Parks
- roads
- water courses
- railways



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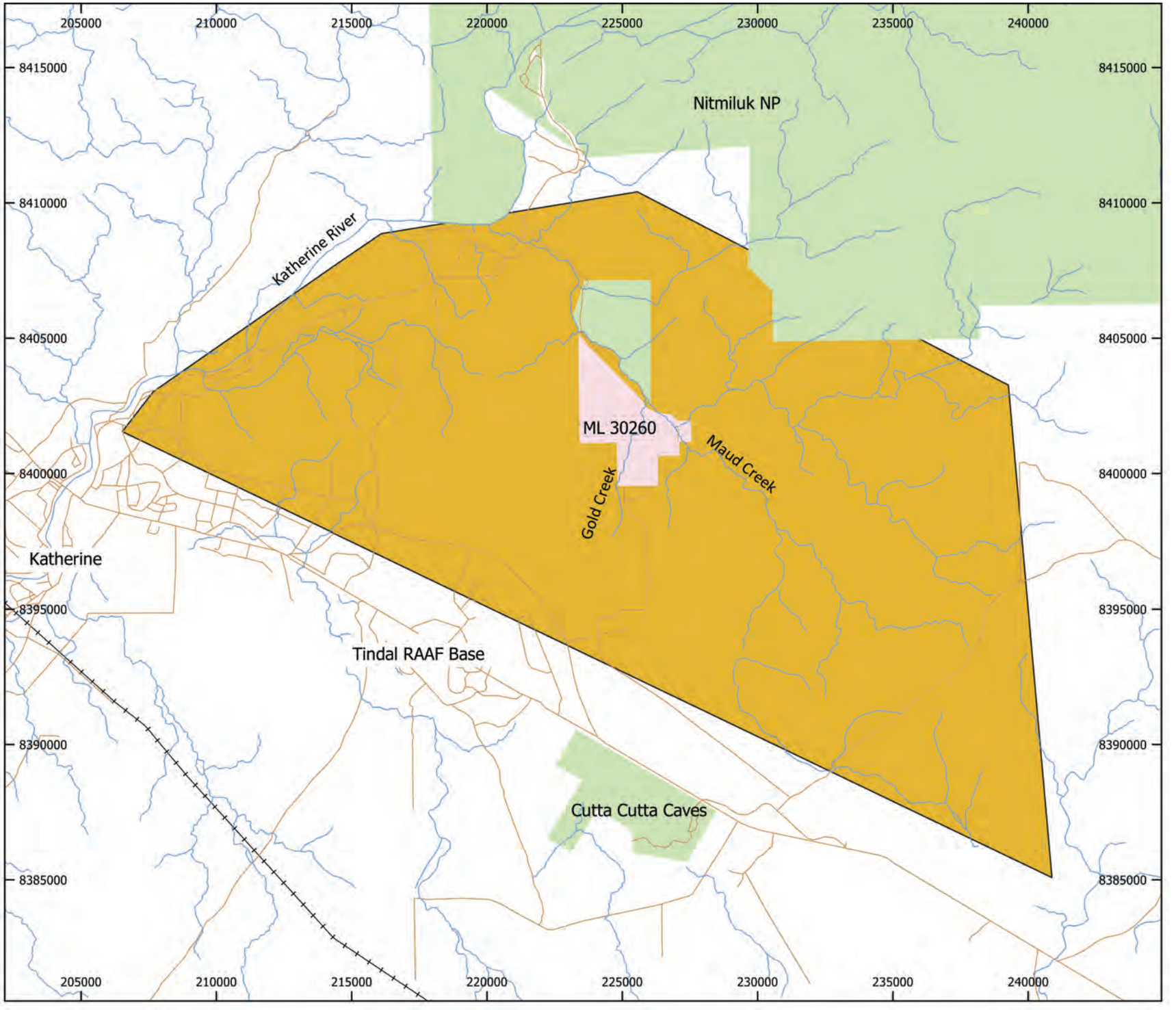


1.2 LEGISLATIVE FRAMEWORK

1.2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, migratory species, ecological communities and heritage places, defined in the Act as Matters of National Environmental Significance (MNES). The EPBC Act is administered by the Commonwealth Department of the Environment and Energy (DEE). It is designed to conserve biodiversity through the protection of threatened species and ecological communities, migratory, marine and other protected species listed in schedules under the Act. The *EPBC Act 1999* also provides a framework for the identification and listing of key threatening processes related to listed threatened species or communities. MNES as defined under the EPBC Act relevant to the current project include:

- Listed threatened species and ecological communities;
- Migratory species protected under international agreements; and
- Key threatening processes.

1.2.2 Northern Territory Parks and Wildlife Conservation Act 1976

The *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) provides for the creation of parks and reserves and their management, and the conservation and sustainable utilisation of wildlife. The TPWC Act is administered by the Northern Territory Department of Environment and Natural Resources (DENR). Species that are considered to be threatened are listed in schedules under the TPWC Act and are managed to maintain or promote an increase in population numbers.

2.0 ENVIRONMENTAL SETTING

2.1 STUDY AREA DESCRIPTION AND CLIMATE

The study area is located in the central catchment of Maud Creek within the Pine Creek Bio-Region of the Northern Territory (IBRA Version 7), approximately 280 km southeast of Darwin and 20 km east of Katherine (-14.445506° S; 132.452786° E, Figure 1). The north-eastern boundary of the study area intersects the south-western margin of the Western Arnhem Plateau, a site of international conservation significance (DENR 2018) which comprises broad areas of sandstone plateau and associated habitats in the Nitmiluk National Park (Woinarski 2009). The study area is also located on the eastern margin of the Cutta Cutta/Tindal limestone karst area. The combination of the close proximity of diverse habitat features, including karst landscapes, open woodland and forest habitats, riparian zones and escarpment areas, is likely to contribute to locally high biodiversity for some fauna groups. However, extensive areas of land degradation and modification of vegetation cover are also evident within the study area, associated with previous mining activities, weed infestation, feral animals and the long history of pastoral activities and water buffalo/cattle grazing (Figure 2).

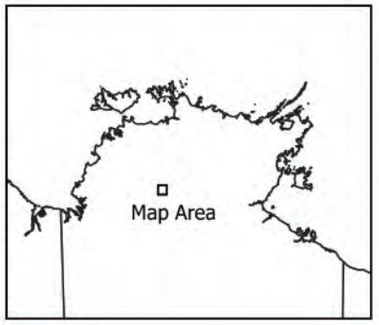
Figure 2 Habitat quality in the study area has been substantially affected by previous open cut mining, resulting in a 35 m deep pit (left) and water buffalo and cattle grazing, particularly during periods of low rainfall (right)

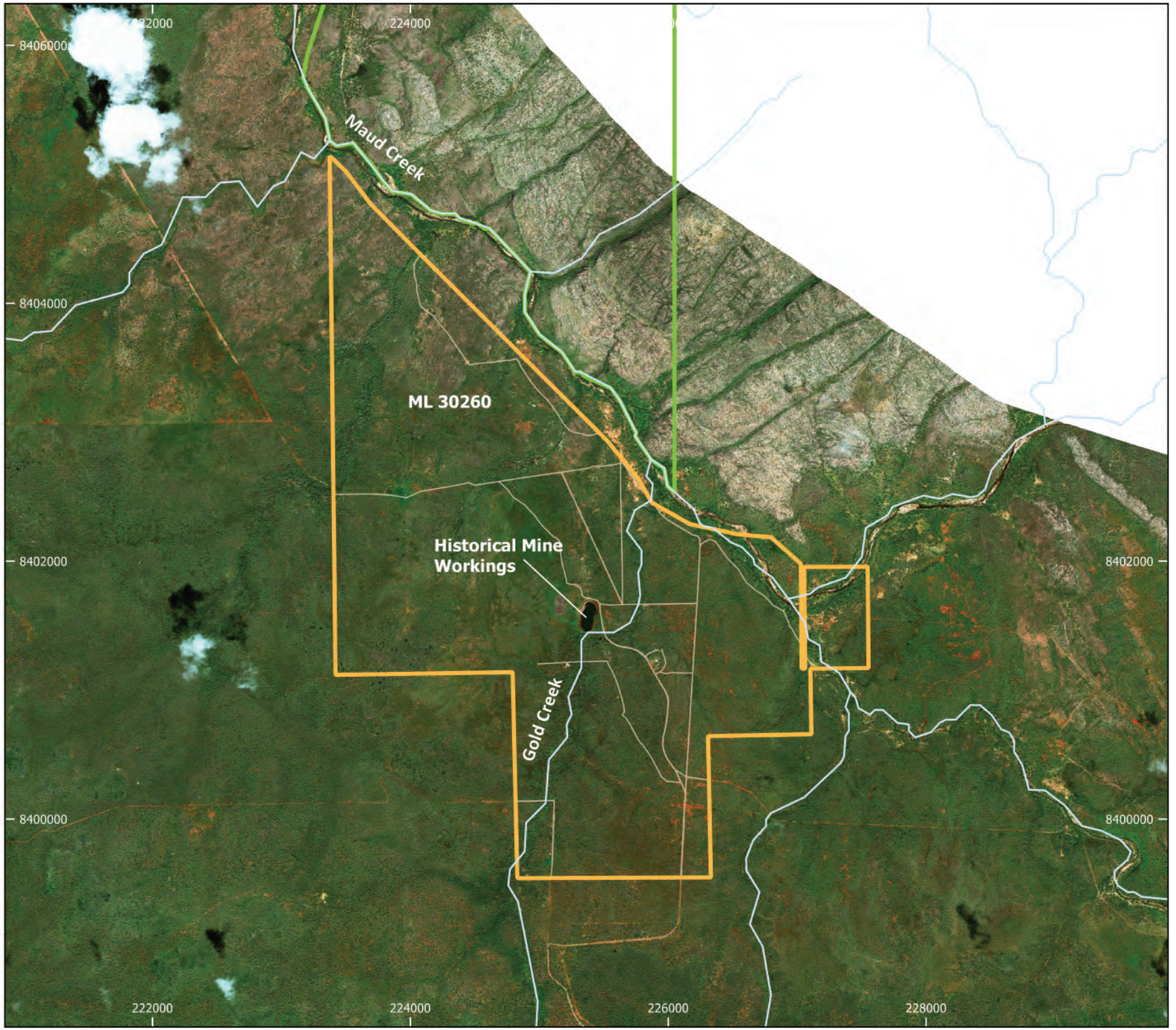
The climate at the study area is characteristic of the northern Australian wet-dry tropics, with 90% of the mean annual rainfall of 1057 mm falling between December and March. Based on data from the Northern Territory Bureau of Meteorology (BOM) station at Tindal RAAF, mean maximum and minimum temperatures range from to 30.1-14.1^{o}C in June to 35.7-25.8^{o}C in December.

Figure 3. Maud Creek Lease Area ML30260

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses

0 0.5 1 1.5 km N

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2.2 DRAINAGE, TOPOGRAPHY AND LAND USE

The study area is located in the central Maud Creek catchment, which drains to the Katherine River to the north of the study area. Maud Creek rises in the stony country to the south of Nitmiluk National Park and flows into the Katherine River about 20 km upstream of Katherine (Figure 1). During the dry season, Maud Creek ceases to flow and dries to a series of very small pools in the lower reaches. Gold Creek is one of several minor ephemeral drainage lines which cross the study area, draining in a north-easterly direction to the main Maud Creek channel.

The topography within the study area is characterised by rolling low hills dissected by alluvial flats. The vegetation within the study area is typically low mixed species open woodland with a grassy understorey. Limestone karst areas are located to the west of the study area. Limited elevated low sandstone areas of the western Arnhem escarpment occur on the north-eastern margin of the study area, adjacent to Maud Creek. Both of these landforms occur outside the current study area and will be unaffected by the proposed mining footprint. Potential access easements to the main highway to the west of the study area potentially intersect karst landforms.

In the past, approximately 96 ha of woodland vegetation was cleared on Maud Creek station for pastoral development and to support exploration and historical mining activity (EcoScience NT 2007; URS, 2008). Current land use is predominantly grazing, with the study area fully encompassed by Maud Creek Station which is heavily stocked with cattle and low numbers of swamp buffalo. During the 2019 survey, cattle were only excluded from one small fenced paddock and the Maud Creek corridor, both located in the northern section of the study area.

There has been a long history of previous mining at Maud Creek (see section 2.3).

2.3 DISTURBANCE FROM PREVIOUS MINING

Gold mining activities commenced at Maud Creek in the 1890's, continued for a short period during the 1930's and were resumed again in 1999 by Katherine Mining NL. Disturbance in the central areas of the lease from historic mining activities includes a large open pit and an associated tailings and waste rock area adjacent to Gold Creek.

The most recent mining at Maud Creek occurred in 2000, when Katherine Mining NL conducted open cut mining for gold and a total of 173,581 tonnes of ore was treated offsite at the Union Reefs mill. Approximately 9 ha of disturbed land (comprising 2.7 ha associated with the pit void, 1.6 ha associated with the former ROM pad and 4.7 ha occupied by a waste rock dump) remain from this period. Minor

disturbance related to support infrastructure (access tracks, relocatable offices) also remains within the study area.

2.4 PREVIOUS SURVEYS

2.4.1 NT Government Flora Surveys

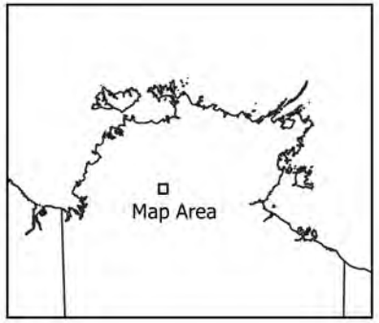
A substantial amount of new information on the flora of Maud Creek station has recently been collected by the Northern Territory Government (NTG) Department of Natural Resources (DENR) during surveys conducted from August 2018 to late 2019. As part of the NTG's *Mapping the Future* program the greater Katherine region (including Maud Creek station) was identified as one of five priority areas in the Top End where a range of natural resource surveys will be conducted from 2018 to 2022. The program is designed to improve current knowledge and assess natural resource development potential in strategic locations, focussing on the survey and mapping of land capability, water availability and biodiversity assets. Surveys in the Maud Creek station area will continue during 2020 and mapping will be available in 2021.

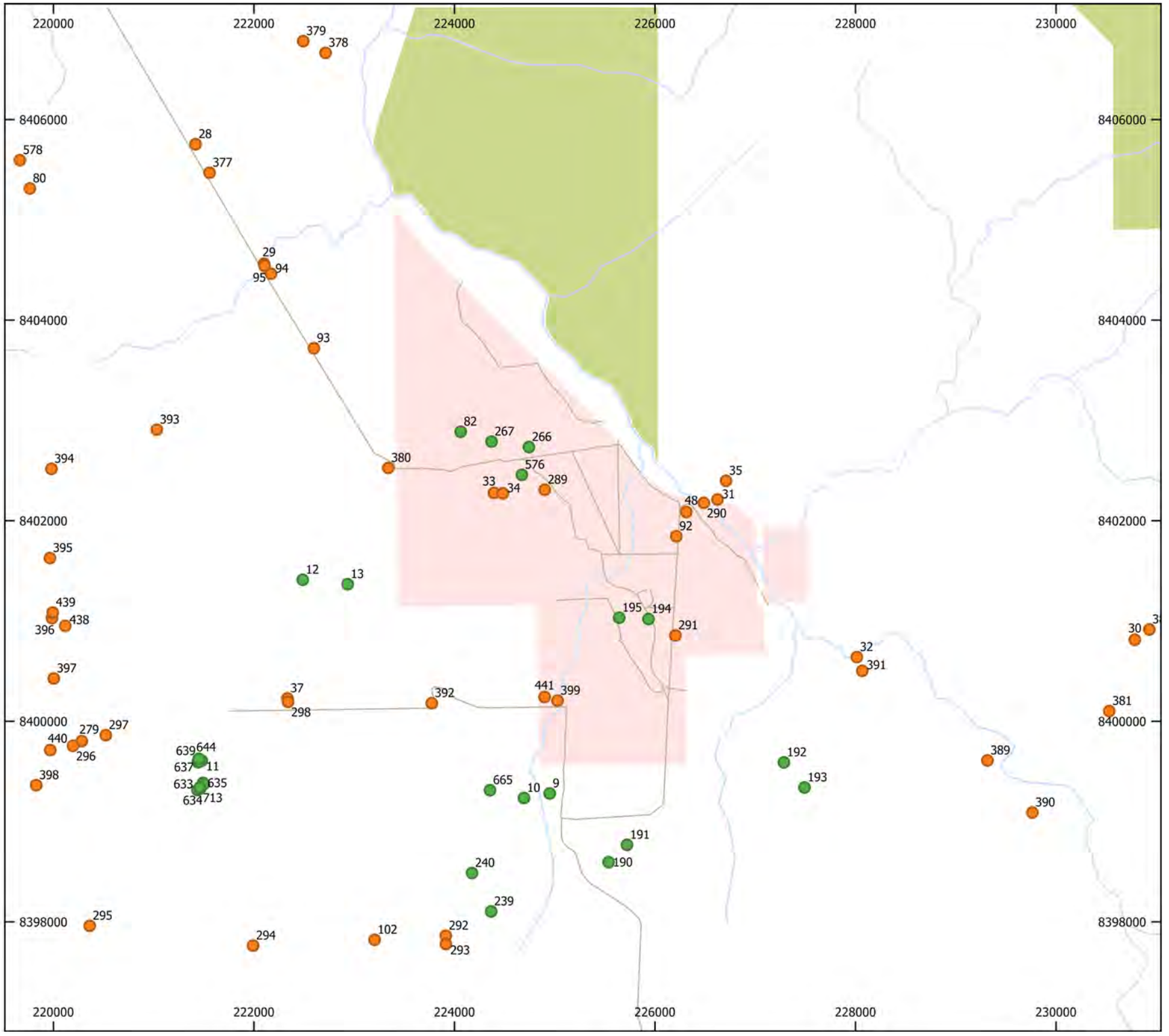
Both the Northern Territory Herbarium and the Rangelands Management Division have been involved in mapping and documenting flora at a total of 758 sites in the greater Katherine region (Figure 4) which extends from the Katherine River to the boundary of King River station. Of that total, 651 sites (denoted by red symbols in Figure 4) were surveyed for resource mapping by the Rangelands division of the DLRM including 436 vegetation community mapping sites and 215 check sites (in which data for dominant species only are recorded). The Northern Territory Herbarium undertook full floristic inventory at a total of 62 sites (green symbols denoted by NRETA) within the same area, where the presence and cover of all plant species within standard 20 m x 20 m study plots was documented. The Herbarium also conducted searches for rare and threatened species as part of the *Mapping the Future* program, to assist in conservation and sustainable management. Species specific sampling in the greater Katherine region concentrated on vine thicket, sandstone and other restricted habitats at a total of 45 sites during the last 18 months. Six herbarium flora sites and nine Rangelands sites are located within the current study area (Figure 4).

Figure 4. NTG Flora Survey Sites Maud Creek Area

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses

NTG sites

- DLRM
- NRETA

0 0.5 1 1.5 km

N

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2.4.2 NT Government Land System and Land Unit Mapping

Several existing landform and vegetation maps cover the Maud Creek study area and these have been examined during the current review and used as a basis for compilation of a habitat map and mapping of vegetation communities (section 3.2). Land systems of the northern part of the Northern Territory (Lynch et al. 2012a) is a recent consolidation of 16 existing Land System surveys that have been updated, compiled at 1:250,000 scale and digitised. Despite the large scale, the map provides an excellent conceptual framework of the landscape, indicating recurring patterns of landform, soils, drainage and associated vegetation types (Figure 5; Table 1).

Three previous land system and land unit maps cover part of the current study extent and were incorporated into the 2012 mapping of land units in the Katherine–Douglas area (Aldrick and Robinson 1972), Katherine Gorge National Park (Sivertson and Day 1984) and the Tipperary Area (Speck et. al 1961). A summary document details the consolidated map categories and reconciles any overlap or gaps in previous land system mapping (Lynch et al. 2012b).

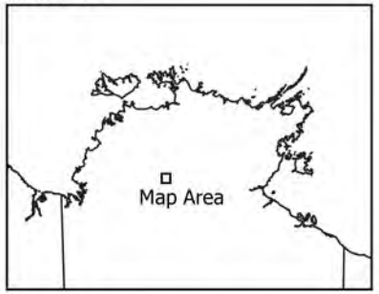
One land system (Vlc2) covers most the study area, comprising extensive basalt plains and rises on lithosols derived from volcanic soils, with minor areas of cracking clays on lower slopes and drainage floors (Figure 5). Associated vegetation is broadly characterized by mid-high open woodland with *Eucalyptus tectifica, Corymbia dichromophloia* and *Eucalyptus tetrodonta* on undulating terrain. Minor areas of limestone plains and rises occur to the south and west of the study area (Bdb and Wrg), with flat to gently undulating limestone terrain and scattered low outcrops. Vegetation in this area is typically low to mid-high woodland dominated by *Corymbia foelscheana* and *E. tectifica* over dense tropical grasses on loamy red and yellow earths.

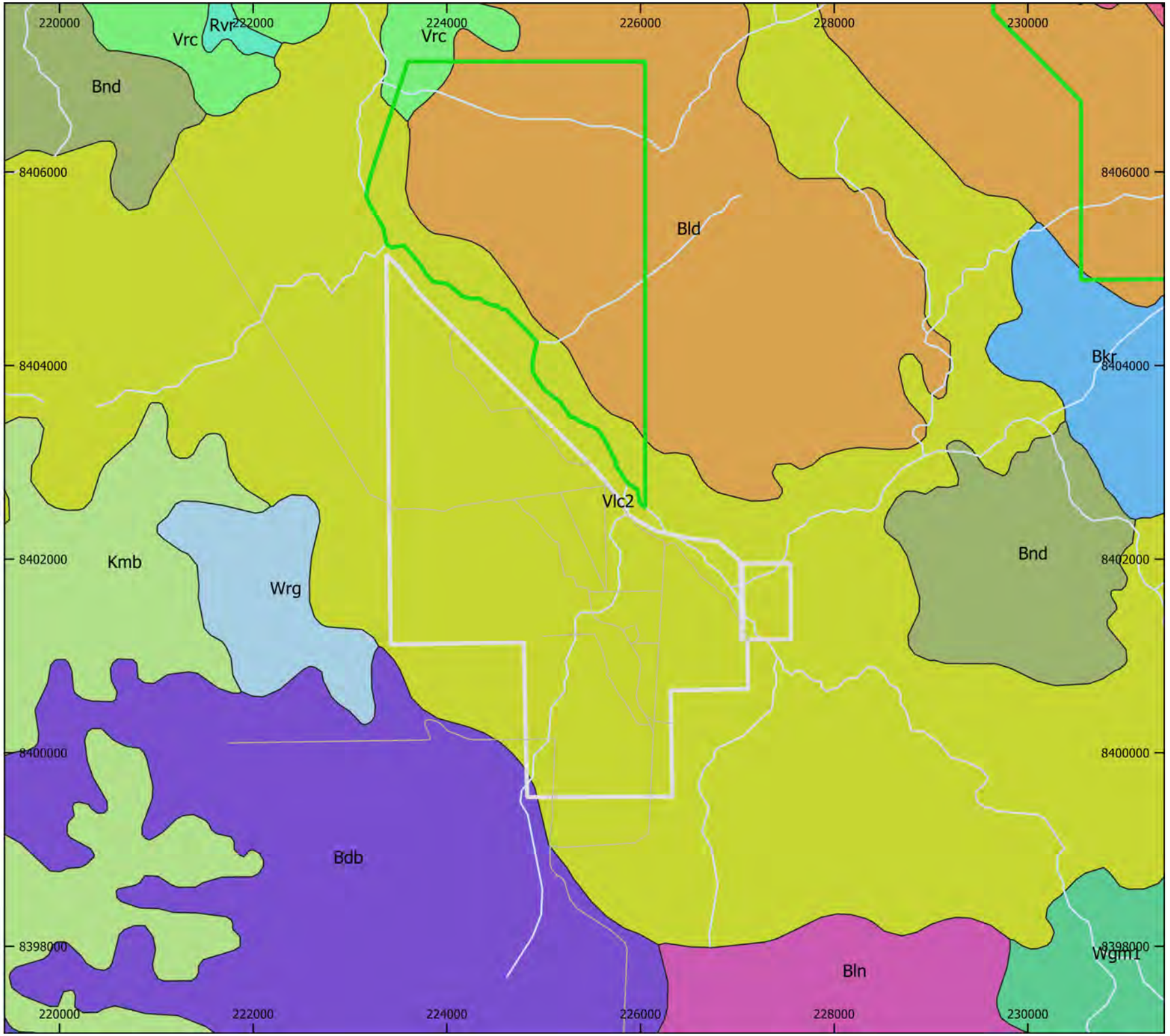
The rugged sandstone plateau of the Buldiva land system (Bld) occurs to the north-east of the study area, comprising steep rocky hills and plateau intersected by deep ravines (Figure 5). This forms part of a disjunct section of Nitmiluk National Park. This area comprises part of the Western Arnhem Plateau and is one of 67 listed sites of significance for biodiversity conservation in the Northern Territory and one of 42 sites considered of International Conservation Significance (DENR 2020).

Figure 5. Land Systems

Base: GEOScience Australia/NTG
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses

Land Systems

- Baker
- Bend
- Blain
- Budbudjong
- Buldiva
- Kimbyan
- Verrucose
- Volcanics 2
- Woggaman 1
- Wriggley

0 0.5 1 1.5 km

N

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Table 1 Key to Land Systems in the Maud Creek Area

KEY TO LAND SYSTEMS		
Code	Land system	Description
Vlc2	Volcanics 2	Basalt plains and rises with lithosols with cracking clays on lower slopes and drainage floors
Wrg	Wriggley	Limestone plains and rises with loamy red and yellow earths. Plains on relatively unweathered limestone, sandstone and siltstone
Bbd	Budbudjong	Limestone plains and rises with loamy red earths. Undulating limestone terrain with scattered low outcrop
Kmb	Kimbyan	Limestone plains and rises on loamy red earths. Gently undulating plains on Cambrian limestone, sandstone and siltstone
Bld	Buldiva	Rugged, rocky quartz sandstone plateau surface (75%) and deep joint-controlled ravines (25%)

2.4.3 NT Government Vegetation Mapping

Vegetation of the study extent has been mapped at a scale of 1:1,000,000 (NVIS level 4) for a vegetation survey of the Northern Territory (Wilson et al 1990), with two widespread Eucalypt-dominated woodland communities mapped within the study area.

Other existing vegetation mapping includes medium resolution (scale 1:100,000) coverage provided by version 4 of the Vegetation Mapping of the Daly Catchment (Cuff 2011). The Daly River Catchment mapping was based on a compilation of the Land Resources of the Daly Basin 1:50,000 land unit mapping vegetation attributes (Aldrick and Wilson 1988) incorporating some additional linework and new classifications from existing site data (Nick Cuff, NT Herbarium pers. comm. 2020). It provides a useful baseline and indication of the wider extent of broad vegetation types occurring within the study area (Figure 6).

Three vegetation communities are mapped by Cuff (2011) within the study area at this scale, the most extensive (Unit 7) is described as alluvial open woodland to woodland of *Corymbia* spp. and *Erythrophleum chlorostachys* over tussock grass associated with sandy alluvial plains and drainage systems (Figure 6). Less extensive areas of sandstone open woodland with *Corymbia dichromophloia* with *Erythrophleum chlorostachys* with tussock grass (Unit 14) are mapped in the northern section of the study area. Five isolated pockets of Eucalypt woodland are mapped within the study area, described as *E. tectifica* and *E. chlorostachys* dominated open woodland with tussock grass (Unit 39).

Existing vegetation maps and land resource mapping compiled by NTG were consulted during compilation of habitat mapping and verification of the distribution of dominant vegetation communities within the study area. The most detailed existing vegetation mapping of the study area and study extent was provided by previous impact assessment studies (Dames and Moore 1999, EcoScience NT 2007) which

contain site specific vegetation community descriptions and vegetation mapping at approximately 1:20,000 scale. Mapping of the greater Katherine region, currently being compiled by the Land Resource Assessment division of the DENR, will incorporate vegetation information collated from the comprehensive DENR flora datasets described above. Due for completion in 2021, this mapping will provide detailed coverage of the Maud Creek project area and the wider Katherine region using data collected in accordance with national standards of the National Vegetation Information System (NVIS).

2.4.4 Previous Impact Assessment Studies

A number of ecological assessments have been undertaken within the study area during previous mining phases. These include flora and fauna surveys conducted for the Environmental Impact Assessment for the Maud Creek project prepared by Dames & Moore Pty Ltd during September 1994, May 1996 and July 1997 for Kilkenny Gold NL. During August 1998, Dames & Moore conducted a review of extension areas surrounding the original Maud Creek site, however this assessment did not include field surveys (Dames & Moore 1998). Results of these surveys are documented in Dames & Moore (1994) and the Maud Creek Gold Project EIS (Dames & Moore 1999).

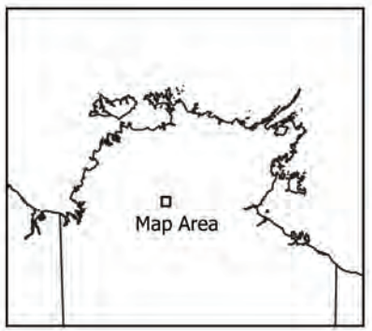
Further ecological studies were conducted within the study area in 2007, commissioned by URS Australia for Terra Gold Mining Pty Ltd (URS 2008). This included an assessment of terrestrial fauna (Ecological Management Services 2007a), aquatic fauna (Ecological Management Services 2007b) and terrestrial flora (EcoScience NT 2007). The 2007/2008 reports represent the most recent impact assessment studies and were based on a disturbance footprint of 160 ha for an open cut mine, ore stockpile, processing plant and tailings storage facility.

The Maud Creek Project EIS (Dames & More 1999) mapped vegetation within the study area, defining eight vegetation communities when mapped at a scale of 1:20,000. That mapping was found to be reliable when ground-truthed and verified during surveys by EcoScience NT. These surveys delineated 10 broad vegetation types within the study area and proposed access road (EcoScience NT 2007).

Figure 6. Regional Vegetation Mapping NTG (Cuff 2011)

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park

Source:
1: 100 000 scale vegetation mapping for the Daly River Basin
For mapping unit codes see descriptions in Cuff (2011)

0 0.5 1 1.5 2 2.5 km

N

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3.0 SURVEY METHODS

3.1 DATA SEARCHES

A list of terrestrial fauna and flora species for the Maud Creek study area and study extent was compiled by reviewing existing historical and recent reports and datasets. Searches of NT Government, Commonwealth Government and NGO databases were conducted to obtain information on species, conservation values and threatened species potentially occurring in the study area. Previous studies and reports relevant to the study area were also reviewed. A list of flora species recorded for the Maud Creek study area is included in Appendix 1.2. Lists of fauna species for the study extent compiled from data searches and other sources are included in Appendix 2 (terrestrial fauna species) and Appendix 3 (aquatic fauna).

3.1.1 EPBC ACT Protected Matters Search Tool

A search using the Commonwealth Government's EPBC Protected Matters Search Tool for the area surrounding Maud Creek study area (10 km search based on a central point located on the Gold Creek historical pit) was conducted in September 2019 (DEE 2019). The search tool generates a report for the area of interest that identifies potential matters of national environmental significance (MNES) or other matters protected by the *Environment Protection and Biodiversity Conservation Act 1999*.

3.1.2 NT Fauna Atlas/NR Maps

Data from the Northern Territory Fauna Atlas was accessed in February 2020 via the Department of Environment and Natural Resources (DENR) NR Maps website (DENR 2020). The data extract included existing fauna records from the region surrounding the study area, with a 5 km search area centered on the Maud Creek pit. The NT Fauna atlas includes point records of fauna, observational data for mammals, birds, reptiles and frogs with associated sighting information.

The NT Flora Atlas accessed through the NR Maps website (DENR 2020) was searched for existing flora records from a smaller search area comprising a polygon defining the study area on Maud Creek station. The plant species list derived was compiled with herbarium records and observational data from all previous flora surveys to provide updated flora information specific to the project area in Appendix 1. The source data for each flora species record is indicated along with its conservation listing (TPWC and EPBC) and NT endemic status. Other DENR website searches were conducted within this search area to determine the presence of introduced, threatened and significant species within the study area.

A search of flora occurring within the study extent (in the wider region surrounding the study area) was also conducted on NR Maps, with particular focus on significant flora, sites of botanical significance and

weeds. The search area for flora within the study extent was bounded by a polygon spanning south from the Katherine River to the southern boundary of land parcel 7056, bordered to the west by the Stuart Highway and Nitmiluk NP to the east and encompassing an area of 459 km^2 (Figure 1).

3.1.3 Atlas of Living Australia

Flora and fauna data from the Atlas of Living Australia (AOLA 2020) was accessed in February 2020 with a search within 5 km of a central point on the Maud Creek lease. The Atlas of Living Australia contains information on flora and fauna species compiled from a wide range of data providers, including museums, herbaria, government departments, non-government organisations and universities (AOLA 2020).

3.1.4 Flora NT

Searches for significant flora, native and introduced species within the study area and the study extent were conducted on FloraNT, the Northern Territory Government's primary online resource for information on the Northern Territory's flora. Images, maps, species checklists, and information on conservation and weed status were derived from the eFlora database as part of the current review of information. Species lists and distribution maps for weeds, significant flora and native plants contain records from both HOLTZE Herbarium specimen data and observations from the Vegetation Site Database (VSD).

3.1.5 Existing Reports and Studies

A review of the terrestrial ecology components of available existing reports and studies relevant to the project was undertaken. This included early reports and papers based on establishment and operational mine phases (Dames & Moore 1994; Martin 1997; Martin 1998; Dames & Moore 1999; EcoScience NT 2007, EMS 2007a, EMS 2007b; URS 2008). Other data was sourced from regional assessments and autecological studies of threatened species. Review of the 2019 Maud Creek Project Area Mine Management Plan (KL Gold 2019) provided recent site-specific information on weed management, habitat condition and water quality within the study area during 2018 and 2019.

3.2 FLORA SURVEY & VEGETATION MAPPING METHODS

3.2.1 Flora Surveys

Several previous surveys have been conducted which provide background information and data for the current project in association with historical mining at Maud Creek. These studies include ecological reports compiled in 1994, 1996 and the detailed flora and fauna studies conducted for the EIS prepared for Terra Gold in 2007. Baseline data from these existing studies has been incorporated into the database of information for the current project. Overall, flora and vegetation within the study area on Maud Creek station has been well surveyed. Recent data obtained for the NTG *Mapping the Future* program provides a comprehensive platform of flora data from the wider Katherine region with at least 15 flora survey sites located within the study area (Figure 4).

In accordance with the current survey objectives, a review of all existing information was conducted and updated information was compiled and presented in this report. Several targeted surveys were also conducted for this ecological assessment, with four new flora surveys completed during 2018 and 2019 (Table 2).

Table 2 Flora field survey dates and objectives for 2018 – 2019 field surveys

Field survey dates	Primary Survey Objective	Flora Consultants
31 May 2018 – 2 June 2018	Site visit, weed survey, ground truthing for habitat and vegetation mapping.	Kristin Metcalfe and Paul Barden
21 – 23 January 2019	Search for *Alloteropsis semialata* and other grasses of significance to gouldian finches.	Michael Jerram
27 – 29 March 2019	Targeted search for significant flora species, flora survey (full floristic) and ground truthing (check sites) for habitat and vegetation mapping. Weed mapping.	Paul Barden, Kym Brennan and Kristin Metcalfe
14 – 16 May 2019	Search for significant species, flora survey (full floristic) and ground truthing (check sites) for habitat and vegetation mapping. Weed mapping.	Kym Brennan and Kristin Metcalfe

An initial flora and weed survey were undertaken by Kristin Metcalfe (EcoScience NT) on 31 May to 2 June 2018. In collaboration with botanist Kym Brennan, searches for flora and vegetation of conservation significance were conducted during 27-29 March and 14-16 May 2019. A targeted search for *Alloteropsis semialata,* a native grass species of critical importance to gouldian finches (and to a lesser extent the grass *Chrysopogon fallax*) was also conducted during the 2018-2019 wet season by Michael Jerram.

The survey for grasses of significance to gouldian finches comprised a thorough search of the study area with a focus around the mine pit from 21-23 January 2019. Using random traverses, the search extended along access tracks and creek lines and included local depressions. Track logs and GPS locations were recorded to document the search area. All vegetation communities within the study area that represented potential suitable habitat for grasses known to provide food for gouldian finches (especially *Alloteropsis semialata* and/or *Chrysopogon fallax)* were searched. Areas away from existing tracks were accessed on foot or using an ATV.

Additional flora sites were surveyed during March and May 2019 in accordance with NVIS methodology using standard full floristic survey techniques. The field methodology employed in 2019 was identical to the EcoScience NT (2007) survey, utilising the same fieldwork proformas. Quantitative survey within 20 m x 20 m quadrats included the following key floristic indicators:

1. Species composition and structure
    - Upper stratum: tree species and abundance, DBH (diameter at breast height), estimated crown cover by species, tree height (range and average height)
    - Mid stratum: species composition and abundance, DBH if ≥ 2 cm and ≥ 2 m, height range, average height
    - Lower stratum: species composition and average height
2. Ground cover—estimated % cover of bare ground, grass, litter and 'other' within 5 randomly placed 1 m x 1 m quadrats.
3. Total basal area of trees (m^2 ha^{-1}) at each study site was recorded using a Bitterlich gauge with 0.25 BAF.
4. Weed cover (estimated percentage cover for individual species)
5. Site disturbance including ranked impact of fire, feral animals, erosion and weeds
6. Site photo. All sites were photographed using a labelled marker board placed 4 m along the diagonal from the NW corner post.

Adjunct information on crown cover was also recorded from transects during the current field surveys to objectively characterise vegetation structure, in accordance with NT Guidelines and NVIS methodology. The canopy cover or crown separation ratio was recorded along transects adjacent to each study plot through vegetation most representative of the wider vegetation community (McDonald et al 1984).

Combined with previous surveys, a total of 20 sites (denoted by prefix MC) have been established at key locations within the study area (Appendix 2.2). New sites established in 2019 were selected in areas where

no sites had previously been surveyed (either by EcoScience or NTG) in communities located as close as possible to the proposed project footprint. Targeted searches for species of conservation significance were conducted during each of the four surveys with a focus on areas that may be most impacted by the proposed development. For example sites where *Tephrosia humifusa* had previously been recorded were searched for evidence of this species during the 2019 surveys. Habitats most likely to contain threatened flora were also the focus for recent field surveys including ungrazed vegetation, riparian and limestone vegetation communities within the study area.

3.2.2 Vegetation Mapping Methods

A key objective of this review was to compile broad habitat mapping and to refine mapping of vegetation surrounding the project footprint while conducting targeted searches for significant flora. A revision of existing vegetation mapping was undertaken with reference to the Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping (Brocklehurst *et al.* 2007). Data and mapping downloaded from Northern Territory Government websites was reviewed to determine the distribution of land systems, soil types and underlying geology. Existing vegetation mapping for the lease area (Dames & Moore 1998; EcoScience NT 2007) and Vegetation Mapping of the Daly River Catchment (Cuff 2011) which includes the Maud Creek area assisted in the delineation of vegetation community boundaries (as described in section 2.4.2).

Where appropriate, detailed floristic site data from previous reports (Dames & Moore 1999, EcoScience NT 2007) was used as a baseline for compilation of revised mapping for the study area. Combined with additional sites established during this study and DENR sites, a thorough network of sites was available to determine linework for habitat mapping and refining vegetation community boundaries (Figure 7).

During the current and previous EcoScience NT field surveys, check sites (Brocklehurst *et al.* 2007) were used to update and refine vegetation mapping. Check site locations were recorded in the field using a hand-held GPS and the following data recorded:

- Dominant species in upper, mid and lower ground strata;
- Average tree and shrub height;
- Weed species and a ranking of weed density;
- Site descriptions and photographs.

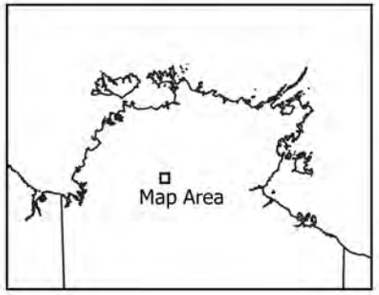
The collection of check site data was designed to verify vegetation in areas not covered in previous surveys, particularly habitats that are potentially of importance to threatened fauna species (e.g. gouldian finch potential breeding habitat). During the June 2018, and the March and May 2019 surveys, 39 check

sites were examined within the Maud Creek study area (Figure 7). Vegetation mapping data from new check sites was combined with 29 ground-truthing or check sites surveyed in 2007. Check sites were mainly located in areas surrounding the proposed mine, in the vicinity of the pit and riparian habitats along Gold and Maud Creeks and along access roads.

Figure 7. EcoScience NT and NTG Flora Sites Maud Creek

Base: GEOScience Australia/NTG
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses
- 2018-2019 ES Check Sites
- 2007 ES Check Sites
- EcoScience MC Flora Sites
- NTG Flora Sites

0 0.4 0.8 km

N

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3.3 TERRESTRIAL FAUNA SURVEY METHODS

The terrestrial fauna survey was designed to assess the potential for listed threatened species, other significant species and matters of national environmental significance (MNES) within and adjacent to the project area. The methods were based on a preliminary review of the relevant species known to occur in the region and considered to potentially occur in the local area based on existing records or known habitat (Table 3).

The proposed methodology for the camera trapping component was designed in consultation with the Northern Territory Government following discussions regarding the project with the Department of Environment and Natural Resources (DENR) Flora and Fauna Division in early 2019. Other survey methodologies were conducted with reference to existing guidelines for surveying threatened fauna species, including threatened mammals (DSEWPC 2011a), northern masked owl (DLRM 2010), threatened birds (DSEWPC 2011b) and northern quoll (DOE 2016a).

Table 3 Fauna field survey dates and objectives for 2018 – 2019 field surveys

Field survey dates	Primary Survey Objective	Flora Consultants
31 May 2018 – 2 June 2018	Aquatic fauna (macroinvertebrate) sampling. Incidental bird surveys. Targeted surveys for significant woodland birds (e.g. crested shrike-tit, gouldian finch).	Kristin Metcalfe and Paul Barden
21 – 23 January 2019	Search for *Alloteropsis semialata* and other grasses of significance to gouldian finches. Opportunistic surveys for significant woodland birds.	Michael Jerram
27 – 29 March 2019	Install camera traps. Targeted surveys for significant woodland birds (e.g. crested shrike-tit).	Paul Barden
14 – 16 May 2019	Repeat surveys for significant woodland birds, northern masked owl surveys. Retrieve camera traps.	Paul Barden

3.3.1 Camera Trapping

Camera trapping was undertaken at locations across the study area using 5-camera grid arrays following methods developed by the NTG for the Katherine region. Camera trapping was designed to target a number of threatened fauna species known or potentially occurring in the Katherine region, including the northern quoll (*Dasyurus hallucatus*), black-footed tree-rat (*Mesembriomys gouldii*), partridge pigeon (*Geophaps smithii smithii*) and gouldian finch (*Chloebia gouldii*). Five camera trap grids were set to sample the broad vegetation types within the central study area (Figure 8). Cameras used during the survey were Reconyx HP2 White Flash focused to 150 cm (n = 25). Cameras were set for night operation/rapid-fire/high sensitivity/three images and one video per trigger. Each camera was left in the field for a period exceeding

47 survey days/nights, for a total camera trapping effort of 1,175 camera trap nights (28/03/2019 to 14/5/2019). Each camera was baited with a standard PVC bait chamber consisting of PVC pipe and vent cowls attached to a survey peg and baited with a standard bait mix of honey, oats and peanut paste.

Camera trap arrays included a 0.5-hectare camera grid, with one camera located at a central point and four additional cameras located at 50 m intervals to the north, south, east and west. Cameras were placed on a tree 35 cm above the ground, facing the base of the bait station at 150 cm from the camera. The central grid camera station included a 10 m drift fence and 30 x 30 cm cork-board arrangement. The central camera was set on a 45 degree angle at 65 cm above the ground facing the cork board, which was located 65 cm from the base of the tree supporting the camera.

3.3.2 Woodland Bird Surveys

Woodland birds were surveyed during site visits conducted in June 2018, January 2019, March 2019 and May 2019. The surveys where designed to target significant woodland bird species, including the gouldian finch, squatter pigeon, northern crested shrike-tit and red goshawk.

27 woodland bird survey sites were sampled within the study area, with surveys repeated during three time periods (June 2018, March 2019 and May 2019 (Figure 9). At each location, a 15 minute “standardised search” (Watson 2003) was conducted. Standardised searches were conducted by moving throughout the vegetation class and identifying all birds observed or heard during the 15-minute period (Watson 2003). All bird taxa observed were recorded and the observer was free to move within the habitat within the 15-minute count period. Care was taken to limit sampling to a broad vegetation class (e.g. riparian forest, mixed eucalypt woodland). A waypoint was recorded at the starting point for each sample location (Figure 9). Birds were excluded if they were overflying the habitat and not actively engaged in hunting or foraging. Approximately 20 hours of bird surveys were conducted across the three survey periods.

On completion of each standardised search, a call broadcast session was undertaken to assess the presence of the northern crested shrike-tit (vulnerable, EPBC Act). This method followed guidelines recommended by the Commonwealth guidelines for surveying threatened birds (DSEWPC 2011a) and included a series of broadcasts of the crested shrike-tit call followed by listening periods over a 10-minute period at each location.

Incidental woodland bird records were compiled during other surveys conducted within the study area. This included transect surveys for gouldian finch grasses undertaken in January 2019. Raptor nests identified in the field were investigated to identify the occupants.

Camera traps (Reconyx HP2 White Flash) were set at three pools and artificial water points within the study area and two artificial watering points on the site access road (Figure 9) for a total of 235 camera trap nights (28/03/2019 to 14/5/2019). The cameras were set at locations where grass finches and pigeons were observed drinking and were designed to capture images of drinking gouldian finch and squatter pigeon.

3.3.3 Northern Masked Owl Surveys

Call broadcast call surveys were used to assess the presence of the northern masked owl (vulnerable, EPBC Act) within the study area during the current survey using a methodology based on (DSEWPC 2011a). Surveys were conducted on one night in May 2019 and included sites on tracks within the study area and access road. A total of 13 call broadcast sites were sampled at 500 m intervals along access tracks within the main Maud Creek lease area (Figure 9) and four additional sites were sampled on the access road at 1.5 km intervals (Figure 9). Weather conditions during the nocturnal surveys were generally suitable for call broadcast surveys, with light winds and clear conditions.

On arrival at the broadcast station, a brief spotlight scan and listening period was undertaken to determine the presence of owls in the local area. If no owls were detected, northern masked owl screech and chatter calls (20 seconds) with intervening periods of silence (65 seconds) were broadcast using a modified 10w transistor megaphone (Toa). The sequence of call broadcast and silence was repeated seven times for a total broadcast session of 10 minutes at each station. Observers located within 50 m of the broadcast station listened for call responses and recorded observations of approaching owls. If masked owls were detected at a station, the session was discontinued. If owls were not detected during the 10-minute call broadcast period, a subsequent 5-minute period of listening and spotlighting was undertaken in the area immediately surrounding the broadcast station. The northern masked owl calls used in the broadcast were recorded on Groote Eylandt using a Marantz PMD661 digital recorder and Telinga Pro microphone.

Spotlight survey was conducted from a vehicle while moving between sites. Incidental sightings of other nocturnal fauna species were recorded.

3.3.4 Microchiropteran Bats

EMS (2007b) conducted a detailed survey of bats within the Maud Creek lease area, with trapping and acoustic detection surveys conducted at multiple sites. This survey recorded fifteen microchiropteran bat species within the study area (EMS 2007b). During the 2018-2019 surveys, bats were recorded incidentally during spotlight surveys undertaken for the masked owl surveys, and a hand-held full spectrum Titley Walkabout bat detector was used to record echolocation calls during these surveys (approximately 6

spotlight/recording hours in May 2019). Bats located on barbed wire fences within the lease were identified. Any locations potentially supporting roosting bats were investigated.

3.3.5 Incidental Records

Observations of terrestrial vertebrate fauna species have been compiled during all surveys conducted within the study area 2018 and 2019, including flora and aquatic ecology surveys.

3.4 FRESHWATER FISHES SURVEY METHODS

Surveys of freshwater fishes have been conducted within the study area during previous survey phases. , Dry season fish surveys, including sites on Maud Creek down and upstream of the Gold Creek confluence, were undertaken in the early to mid-1990s (Dames & Moore 1994; Martin 1996). Freshwater fishes were also sampled in Gold Creek and Maud Creek in 2007 (EMS 2007a). During the current survey, freshwater fishes were sampled incidentally using observations and bait traps at macroinvertebrate collection sites in June 2018.

3.5 AQUATIC MACROINVERTEBRATES SAMPLING METHODS

In the Northern Territory, AusRivAS models have been developed for the Darwin - Daly region (Lamche 2007). Consequently, the macroinvertebrate sampling and laboratory processing for Maud Creek/Gold Creek was conducted following established AusRivAS protocols and following macroinvertebrate sampling conducted at the site by EMS (2007). In this program, most aspects of sampling and laboratory processing closely follow established NT protocols (Lamche 2007) with reference to Lloyd and Cook (2002) for sampling riffle habitats. The main departures from the Northern Territory AusRivAS methodology were:

- The sampling of habitats other than edge habitat, which is the principal focus of the NT AusRivAS protocol (Lamche 2007). Riffle habitats (QDNRM 2001) were sampled at all sites where this habitat was available; and
- Identification of macroinvertebrate groups to a lower level than Family/Sub-family.

Aquatic macroinvertebrate sampling was timed to coincide with the recessional flow period 4 to 6 weeks after the last wet season storm flush. The appropriate sampling period in the Katherine region of the Northern Territory is generally April to June. This enables sampling that integrates the effects of wet season flows while capturing maximum biodiversity by allowing time for macroinvertebrates to recolonise stream habitats following flood disturbance (Lamche 2007).

Sample sites were selected with reference to the location of previous macroinvertebrate sampling sites (EMS 2007a) and KLG surface water monitoring sites. Six sites were selected for sampling in 2018, including four on Gold Creek and two on Maud Creek (Figure 10).

3.5.1 Environmental Variables

At each collection site, a range of standard surface water, spatial and habitat variables were measured during sampling (Appendix 3). Environmental habitat variable measures generally conform to standard NT and Queensland AusRivAS protocols (Lamche 2007, Lloyd & Cook 2002). Environmental variables were measured to assess the extent of the potential impacts on surface water and sediments by past mining activities, pastoral activities and the influence of natural habitat factors and to enable interpretation of differences in macroinvertebrate assemblages between sites.

3.5.2 Field and Laboratory Surface Water Variables

At each site, a suite of field water quality parameters was measured using a calibrated portable water quality meter. The surface water testing was conducted by KLG/NTMO staff as part of an ongoing water monitoring program at Maud Creek within 24 hours of the macroinvertebrate sampling. Parameters included hydrogen ion concentration (pH), dissolved oxygen (mg/L), turbidity (NTU), oxygen reduction potential (ORP), water temperature (^{o}C), electrical conductivity(µS/cm) and salinity (µS/cm).

Surface water samples were collected at each site for laboratory analysis. Samples were collected from the edge of the waterway with a preference for flowing or clear water free of disturbed sediments at a site representative of the reach. Samples were analysed by Northern Territory Environment Laboratories (NTEL), Darwin. General parameters included hydrogen ion concentration (pH), buffering capacity (alkalinity), electrical conductivity (EC), total dissolved solids (TDS) and total suspended solids (TSS). Surface water samples were also collected for analysis of filtered concentrations of a range of dissolved metals, major anions and major cations.

3.5.3 Habitat Variables

Habitat variables were recorded for the 100 m reach and for the habitats sampled within this area (edge and riffle) at each site . Measurement of habitat variables is based on Lamche (2007). Habitat site variables include edge and riffle habitat characteristics, 100 m reach substrate, riparian vegetation and stream morphology and 100 m reach water quality and disturbance observations (Appendix 3). At each sampling location (habitat) flow velocity (m/sec) was measured using a flow probe (Global Water). Three measurements of stream flow velocity and depth were taken from each sampled habitat and site flow rate (m/sec) was determined from the mean of six velocity measures.

3.5.4 Macroinvertebrate Sample Collection

During the recessional flow period 2018, samples were taken from edge habitats at each site and riffle habitat samples were collected at each site where this habitat was present. Edge habitat samples were

collected at a location where the bank was as close to vertical as possible, supporting abundant root material, with a depth varying from 0.3 to 0.5 m and with a low water velocity. A cultivator rake was used to disturb root material and/or substrate along a 10 m transect of edge habitat. A standard macroinvertebrate sampling net (triangular 50 cm x 35 cm base, 250-micron mesh) was used to collect dislodged material, with the net retained on the downstream side of the disturbance where flow was present.

Riffle habitat included a reach of steep, fast flowing and broken water over a rocky/stony substrate. Areas supporting large slabs of rock or bedrock were avoided. A .35 m x 10 m length of riffle habitat was sampled using a cultivator rake to disturb the substrate and by hand washing 5 representative stones to dislodge organisms (cobble wash) while holding the net downstream of the area of disturbance. Material from woody debris, root masses, algal mats or macrophytes was avoided.

3.5.5 Macroinvertebrate Sample Processing

Field and laboratory processing of macroinvertebrate samples followed the Northern Territory AusRivAS manual (Lamche 2007) and included the following:

Field

- The samples were washed through nested sieves, including a 10mm course sieve to remove the coarse organic fraction and a 250-micron sieve.
- Components of the organic fraction were washed and checked for macroinvertebrates prior to being discarded.
- The sample from the 250-micron sieve was stored in 80 - 90% ethanol preservative for laboratory analysis.

Laboratory

- Samples were thoroughly rinsed with water through a 500-micron sieve in the laboratory prior to sorting (Lamche 2007).
- The samples were washed into a sub-sampling box and the sample was spread evenly between cells. Each cell represented 4.2% of the total sample.
- Cells (sub-samples) were selected randomly and the contents were removed to a sorting tray/channel tray using a large pipette.
- The contents of each cell were scanned with a stereo dissecting microscope at 10x magnification in the sorting tray and macroinvertebrates were removed for identification.

- The sub-samples were searched until a target of 200 organisms was reached. A sample of 220 organisms was effectively taken to account for any taxa that could not be identified, were damaged or were not part of the analysis (e.g. microcrustacea, exuviae).
- In accordance with Northern Territory AusRivAS methods microcrustacea (Ostracoda, Cladocera, Copepoda, and Conchostraca) were excluded from the analysis (Lamche 2007).
- The number of sub-samples required to obtain the 200 (220) organisms was recorded and the time taken to search each cell was recorded.
- All macroinvertebrates were extracted from a sub-sample once that cell was selected for analysis, even if the 200 (220) organism count was reached or passed.
- If 220 organisms could not be collected from a sample, a cut-off time of four hours was applied (Lamche 2007).
- The residue from the subsampling box was then scanned and any large/rare organisms were removed and placed in a separate container and recorded as extras.
- Residues from the sample were retained in 70% ethanol until data analysis was completed.

Specimens extracted from the samples were identified to genera and/or species types except for a small number of groups. Macroinvertebrates were identified using an 80x stereo microscope (Leica Microsystems) using reference collection material from the Maud Creek site and other sites in the Top End, and available keys and guides Reference material included the CSIRO Australian Aquatic Invertebrates web keys, Murray Darling Freshwater Research Centre Guides (MDFRC 2006) and guides from the Murray Darling Cooperative Research Centre for Freshwater Ecology Aquatic Invertebrate Identification series. Other identification guides included Theischinger & Hawking (2006) for larval dragonflies (Odonata), Anderson & Weir (2004) for aquatic bugs (Hemiptera), Hawking (2010) for aquatic moth larvae (Crambidae) and Madden (2010) for non-biting midges (Chironomidae).

3.5.6 Data Analysis

Analysis of the freshwater macroinvertebrate and water chemistry/habitat data was undertaken using PRIMER-7 and PERMANOVA+ (Clarke and Gorley 2006; Anderson et al. 2008). All abundance data was pre-treated and transformed (log [x+1) prior to the analysis. Water chemistry and habitat variables were also pre-treated (log [x+1] transformation, normalised) to account for various measurement scales and to correct asymmetric (positive) distribution (Clarke and Gorley 2006). Ordinations were based on Bray - Curtis similarity (abundance data) and Euclidean distance (environmental data).

Relationships among the samples and habitats were investigated using several routines in PRIMER/PERMANOVA+, including ordination (hierarchical cluster analysis and MDS), DIVERSE (generation of abundance and diversity measures) and distance based linear models (DISTLM) using AIC (Clarke and Gorley 2006; Anderson et al. 2008).

Unless specified, default values or procedures recommended in PRIMER-7 (Clarke & Gorley 2006) and PERMANOVA+ (Anderson et al. 2008) were used for the analysis routines. Results are statistically significant (rejecting the null hypothesis of no differences between groups of sites/treatments) if the generated p-value is less than 0.05 ($p<0.05$). Water and fluvial sediment chemistry parameter values below the detection limit were allocated a value of half of the limit prior to analysis.

Table 4 Status and Survey Methods – Known and Potential Threatened Fauna Species, Maud Creek Study Area

NT = Near Threatened; VU = vulnerable; EN = endangered; CE = critically endangered.

EPBC = Commonwealth *EPBC Act 1999;* TPWC = Northern Territory *Territory Parks and Wildlife Conservation Act 1976*

Common Name	Scientific Name	Status		Potential Occurrence Maud C			Species Summary	Survey Methods – Current Survey	References
		EPBC	TPWC	Confirmed	High	Low			
Northern masked owl	*Tyto novaehollandiae kimberli*	VU	VU			X	A single historical (1991) record from southern Nitmiluk National Park. No previous records from the Maud Creek area. Known to occur in tall open forests, swamp forests and woodlands.	• Nocturnal masked owl call broadcast surveys	DSEWPC (2011b) Ward (2010)
Partridge Pigeon (eastern)	*Geophaps smithii smithii*	VU	VU		X		One historical record 8 km SE of the study area. Several other records in the Katherine/Tindal area. Habitat includes open woodland, forest.	• Woodland bird surveys • Incidental observations • Camera trapping at water points	DSEWPC (2011b)
Red Goshawk	*Erythrotriorchis radiatus*	VU	VU	X			Observed in the Maud Creek lease during previous surveys (EMS 2007b). Habitat includes open woodland, forest and riparian zones.	• Woodland bird surveys • Checks of raptor nests	DSEWPC (2011b)
Grey Falcon	*Falco hypoleucos*		VU			X	Historical sightings near Cutta Cutta Caves	• Woodland bird surveys • Checks of raptor nests	DSEWPC (2011b)
Northern Crested Shrike-tit	*Falcunculus whitei*	VU	NT			X	One record near Tindal (1998). Multiple regional records in the Katherine area and to the south of the study area towards the Bullman/Central Arnhem Highway. Suitable habitat includes lowland woodland and forest with mixed eucalypt species.	• Woodland bird surveys • Call broadcast surveys	DSEWPC (2011b)
Gouldian Finch	*Chloebia gouldii*	EN	VU		X		Multiple records in the Tindal area, including sites adjacent to the Maud Creek lease. Observed in area of hill woodland and other habitats similar	• Woodland bird surveys • Incidental observations • Camera trapping at water points	DSEWPC (2011b)

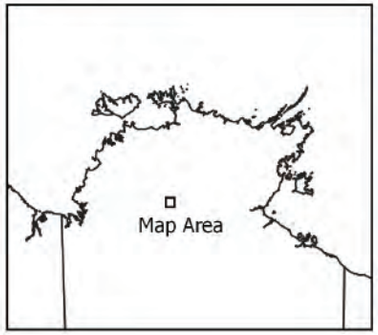
Common Name	Scientific Name	Status		Potential Occurrence Maud C			Species Summary	Survey Methods – Current Survey	References
		EPBC	TPWC	Confirmed	High	Low			
							to Maud Creek station to the north of the study area.		
Northern quoll	*Dasyurus hallucatus*	EN	CE			X	Historical records from the Tindal area, pre-dating the arrival of cane toads in the region. Habitat includes open woodland, forest, swamp forest, sandstone and karst landscapes.	• Collation of incidental sightings during nocturnal and diurnal site surveys. • Identification of tracks and scats indicating occupation. • Camera trap arrays at a suitable density.	DOE (2016a) DSEWPC (2011a)
Fawn Antechinus	*Antechinus bellus*	VU	EN			X	No local records. Listed in EPBC protected matters report. Occurs in open forest and woodland habitats.	• Camera trap arrays at a suitable density.	DSEWPC (2011a)
Northern Brush-tailed Phascogale	*Phascogale pirata*	VU	VU			X	No local records. Listed in EPBC protected matters report. Occurs in open forest and woodland habitats.	• Camera trap arrays at a suitable density.	DSEWPC (2011a)
Ghost bat	*Macroderma gigas*	VU	NT		X		Known to occur in the Tindal and Nitmiluk areas, with records from Cutta Cutta and Tindale RAF base. No previous records from the study area. Roosts in caves and old underground mine workings, foraging in woodland and forest habitats.	• Spotlight surveys during call broadcast. • Assessment of potential roost sites.	DEWHA (2010)
Northern leaf-nosed bat	*Hipposideros stenotis*		VU			X	Records in Nitmiluk National Park. Not previously recorded in the Tindal/Maud Creek area. Roosts in caves and old underground mine workings, foraging in woodland and forest habitats.	• Full spectrum bat detection during spotlight surveys/nocturnal call broadcast. • Assessment of potential roost sites	DEWHA (2010)
Black-footed Tree-rat	*Mesembriomys gouldii*	VU	VU			X	Historical (1973) records from Tindal, recent (2015) records from southern Nitmiluk NP. Potential habitat includes open eucalypt forest and woodland.	• Camera trap arrays at a suitable density.	DSEWPC (2011a)

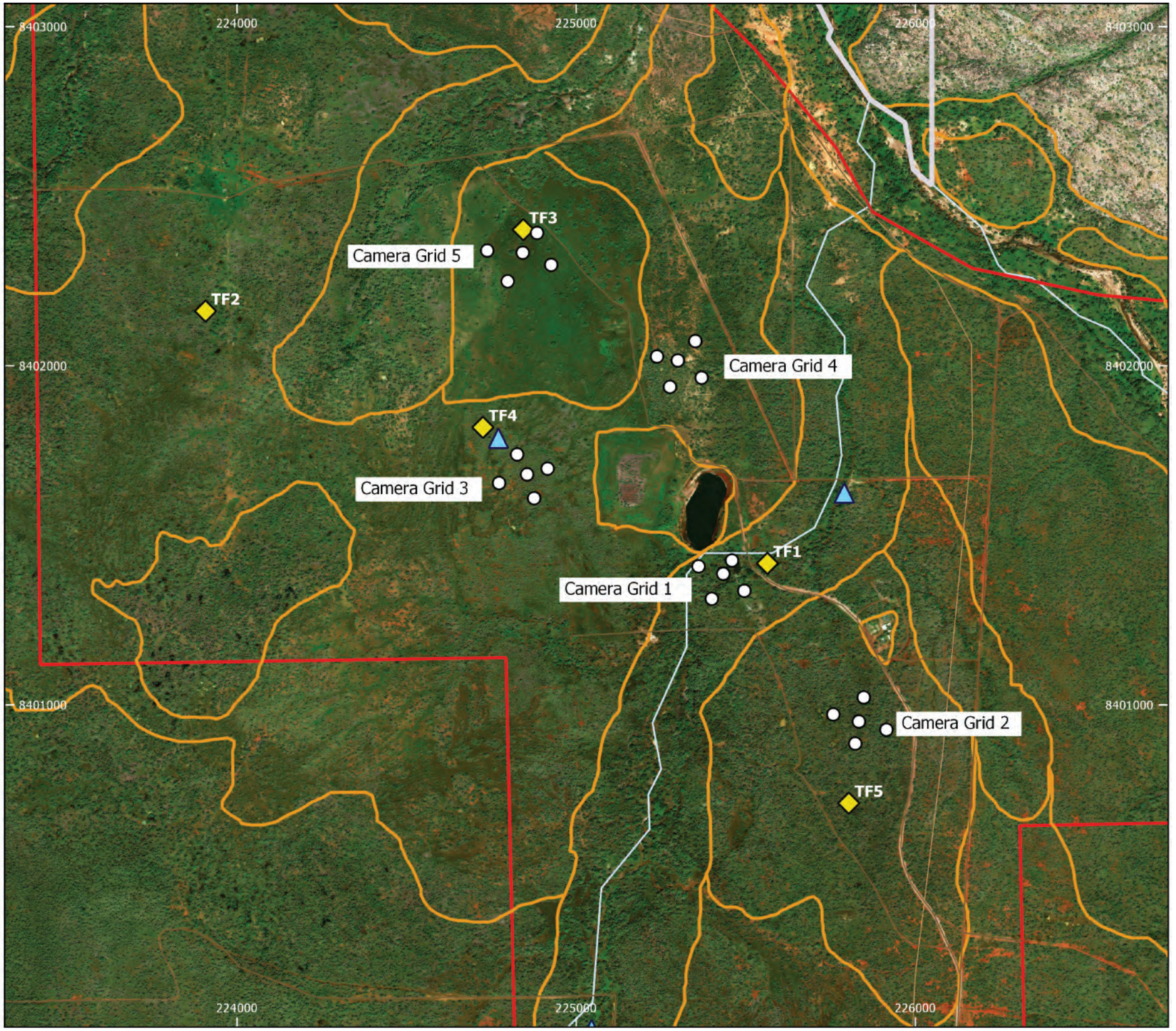
Common Name	Scientific Name	Status		Potential Occurrence Maud C			Species Summary	Survey Methods – Current Survey	References
		EPBC	TPWC	Confirmed	High	Low			
Pale field-rat	*Rattus tunneyi*		VU			X	Previous records south-west of Tindal and Nitmiluk National Park (2015). Potential habitat includes open eucalypt forest and woodland.	• Collation of incidental sightings or signs of occupancy during site surveys (burrows). • Camera trap arrays at a suitable density.	Young and Hill (2012)
Yellow-spotted (floodplain) monitor	*Varanus panoptes*		VU			X	Limited number of historical records close to Katherine. Potentially occurs in floodplain woodland and forest.	• Collation of incidental sightings of large varanids during nocturnal and diurnal site surveys. • Camera trap arrays at a suitable density.	Ward *et al.* (2012a)
Mertens' water monitor	*Varanus mertensi*		VU	X			Previously recorded in the Maud Creek lease area (1996). Potentially occurs along drainage lines in the project area.	• Collation of incidental sightings during diurnal site surveys. • Camera trap arrays at a suitable density. • Camera traps on drainage lines and water bodies.	Ward *et al.* (2012b)
Mitchells water monitor	*Varanus mitchelli*		VU			X	Sightings at Cutta Cutta Caves	• Collation of incidental sightings during diurnal site surveys. • Camera trap arrays at a suitable density. • Camera traps on drainage lines and water bodies.	Ward *et al.* (2012b)

Figure 8. Terrestrial Fauna Survey Sites

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





- National Parks
- Maud Creek Study Area (ML)
- water courses
- roads and tracks
- Camera Traps 2019
- Camera Traps: Water Points
- 2007 Fauna Trapping Sites
- Broad Habitat Types

0 0.1 0.2 km

N

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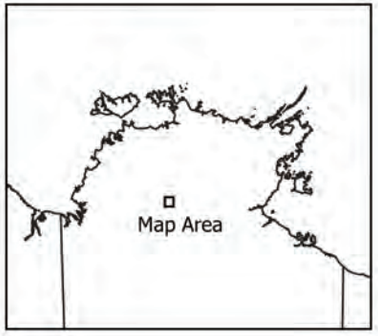
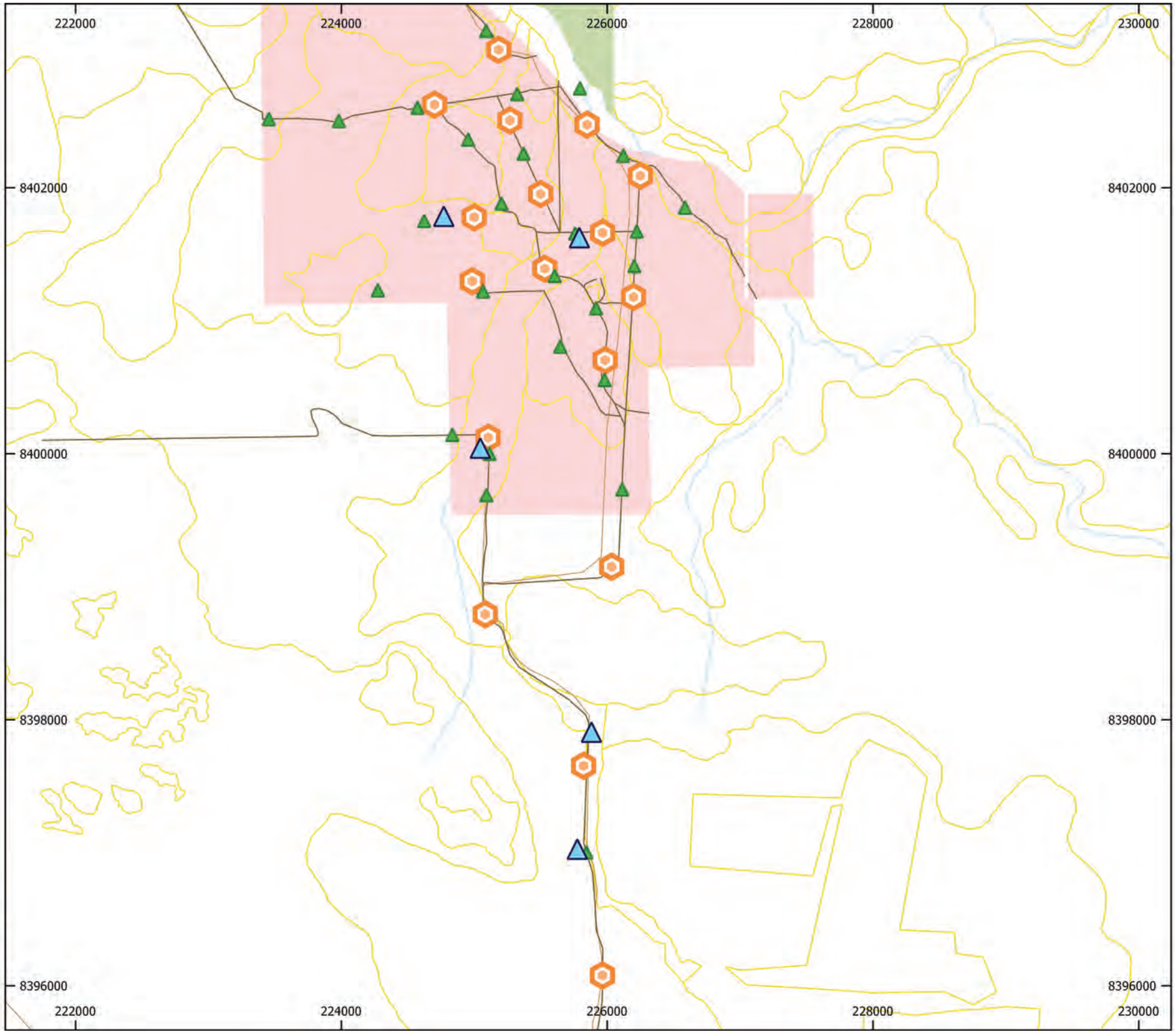
Figure 9. Avian Fauna Survey Sites

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





- National Parks
- Maud Creek Study Area (ML)
- water courses
- roads and tracks
- Camera Traps: Water Points
- Masked Owl Broadcast Sites
- Woodland Bird Counts
- Broad Habitat Types

0 0.25 0.5 0.75 km

N

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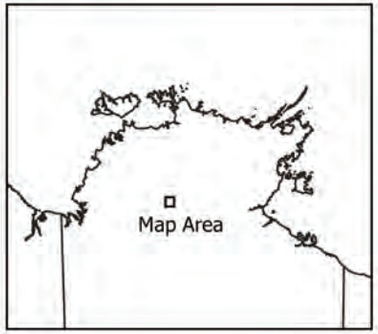
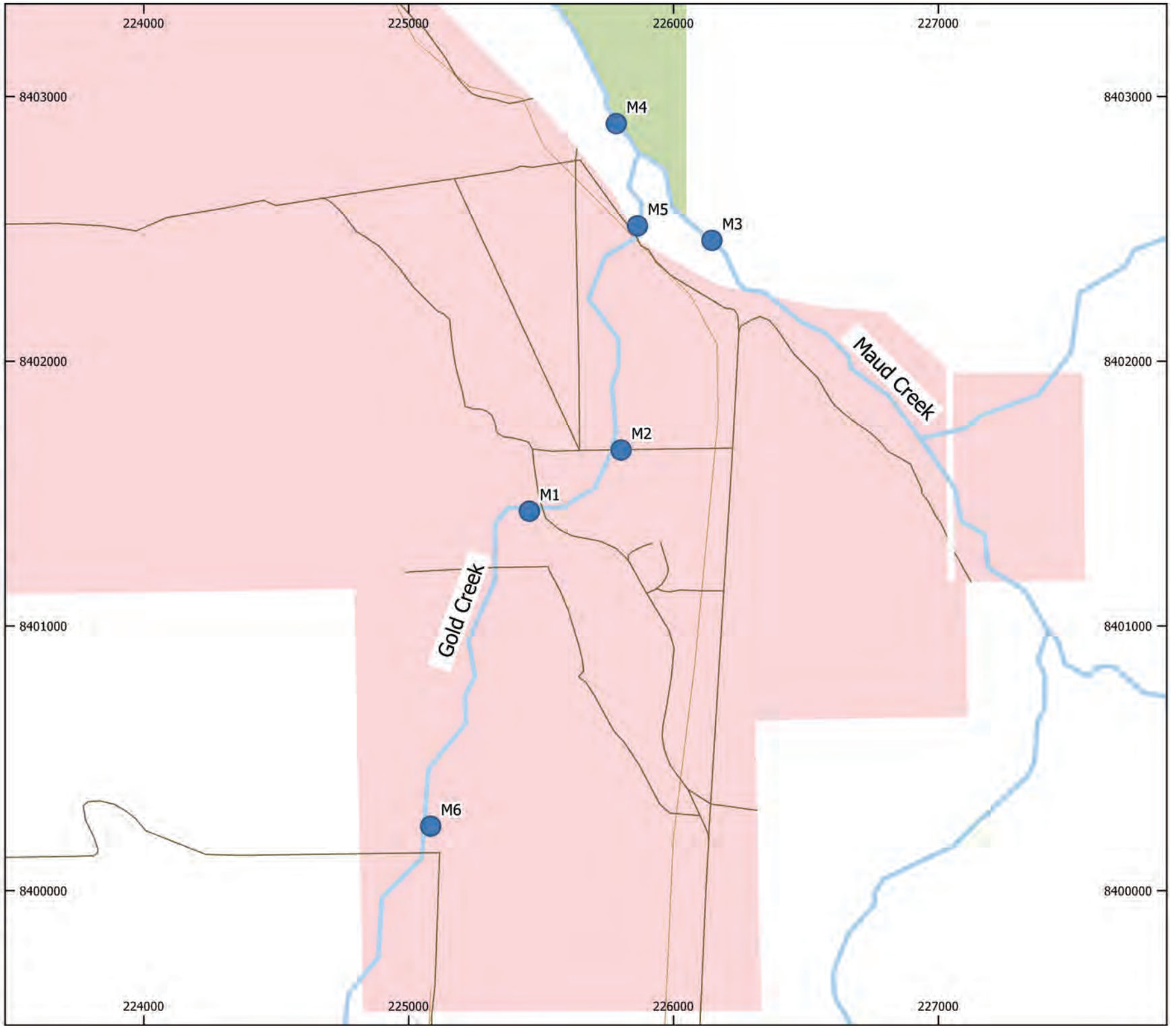
Figure 10. Aquatic Fauna Survey Sites

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





National Parks
Maud Creek Study Area (ML)
water courses
roads and tracks
Aquatic Fauna Sites

0 0.1 0.2 0.3 km

N

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4.0 SURVEY RESULTS

4.1 HABITAT MAPPING

Land unit mapping of the study extent indicates the broad pattern of landform within the region and the broad context in which the study area is placed (Figure 11). Rugged sandstone plateau landform occurs to the north, intergrading with rocky side slopes and low hills which extend into the northern half of the study area. Extensive alluvial plains with areas of limestone (karst) hills and plains predominate throughout the remainder of the study extent.

Habitats within the study area and surrounding area were mapped to delineate landform, soils and broad vegetation types (Figure 12). Within the study extent, five main habitat types were mapped (Table 3) with minor areas of cleared vegetation (habitat category 6). Desktop assessment and field surveys confirmed the presence of 3 broad landform types, 4 habitat categories (rises and hills, alluvial plains, drainage features, cleared/disturbed) and 9 different habitat units within the 1,272 ha study area (Table 5, Figure 12). The main landforms comprise hills and rises, extensive alluvial plains which are dissected by drainage features, with minor areas of limestone plains.

4.1.1 Sandstone Escarpment, Hills and Rises

Steep, rugged, dissected plateaus and scarps associated with the Arnhem Plateau and underlying Kombolgie Sandstones (habitat unit 1) form a sharp boundary immediately adjacent to, but outside, the study area boundary on the northern side of Maud Creek.

The northern section of the study extent is characterised by rugged terrain with low open woodland on steep rocky, side slopes (habitat unit 2a). Outcrop and shallow soils are common on these side slopes which intergrade with lower rocky hills and less rugged terrain (2b). Skeletal and shallow soils in these areas generally support Eucalypt-dominated open woodlands. Dominant to co-dominant eucalypt species include *Eucalyptus tectifica, E. dichromophloia, E. distans, Corymbia confertiflora* and *C. foelscheana*. Only minor areas of steep rugged terrain and rocky hills (2a and 2b) occur within the study area (Figure 12), but a substantial part of the north and eastern study area is occupied by low hills with gently undulating terrain (habitat unit 2c). Dominant species in this habitat typically include *Eucalyptus tectifica* and *Corymbia foelscheana,* with *Erythrophleum chlorostachys* (Ironwood) also commonly present in the canopy.

4.1.2 Alluvial Plains and Rises

The study area mainly comprises flat to undulating, mildly dissected alluvial lands with broadly rounded crests and low rises (habitat units 3a and 3b). Soils are varied and range from shallow and rocky to deep

depending on terrain and vary in type with the parent material. Basalt plains and rises with lithosols are mainly vegetated by *Eucalyptus* dominated woodlands, low woodlands or low open woodlands. Common dominant species include *Corymbia foelscheana, Terminalia platyphylla, E. patellaris* and *E. tectifica*. Rises are generally well drained and support vegetation less than 10 m high over grassland. *Eucalyptus tectifica* and *Corymbia foelscheana* and *C. latifolia* tend to be the dominant low trees on hills and rises (3a). Sands and loams mainly occur from metamorphic and sedimentary geologies and these are most common near the old mine.

Cracking clays (vertisols) have imperfect drainage and occur on lower slopes and drainage floors (3b). These cracking clays are characterised by sparse tree cover and in localised areas, extended seasonal waterlogging may preclude the growth of trees. Mixed species low woodlands are characteristic of this habitat within the study area with dominant trees commonly including *C. foelscheana, E. tectifica, E. confertiflora, Erythrophleum chlorostachys* and *Hakea arborescens*.

4.1.3 Drainage Features

Riparian habitat occurs along the Maud Creek riverine corridor (habitat unit 4a), which flanks the northern boundary of the study area and flows into the Katherine River downstream of the Katherine Gorge. Well-developed woodlands with paperbarks (*Melaleuca leucadendra, M. dealbata*) and *Corymbia/Eucalyptus* spp. (*C. bella, E. camaldulensis*) occur on the deep, sandy soils in this distinctive linear habitat. Abundant weeds tend to occur in association with drainage features which are characterised by seasonal disturbance and elevated soil moisture.

Several other small ephemeral creeks (habitat unit 4b) dissect the extensive eucalypt woodland to open woodland habitats in the study area, with seasonal flows from south to north. Gold Creek has a 23.5 km^2 catchment and is one of the main tributaries of Maud Creek. The open cut pit from previous mining is located near Gold Creek in the centre of the study area. Broad drainage flats and smaller isolated drainage depressions are also associated with these minor drainage lines and support open woodlands, low woodland (e.g. *E. pruinosa)* or mixed species shrub land. A minor area of grassland with scattered trees occurs on black soil just north of the pit (4c). Sparse cover of *Terminalia platyphylla* occurs in this area occasionally with abundant low *T. pterocarya* and *Carissa spinarium*.

4.1.4 Limestone Plains and Rises

Calcareous soils derived from the Tindal Limestone formation occur on limestone plains and rises to the south and west of the study area. Characterised by loamy red and yellow earths, these areas support *Eucalyptus* and *Corymbia* dominated woodlands and open woodlands (habitat units 5a and 5b).

Habitat unit 5a is characterised by undulating limestone terrain with woodland to open woodland and scattered areas of low to well-developed outcrop occur just to the south of the survey area. Flat to gently sloping limestone plains and rises with minor areas of surface limestone and scattered low weathered limestone occur within the study area (habitat unit 5b) but no well-developed areas of limestone outcrop were observed. This habitat is known to support several fauna and flora species of conservation significance, including the near threatened grass *Sorghum macrospermum* (section 4.2.3.), regionally restricted land snails and potential roost sites for threatened bat species. Previous surveys in the area to the west of the study area identified sites with large underground cave structures in the limestone, and these areas are potential roost sites for threatened bat species (EMS 2007b).

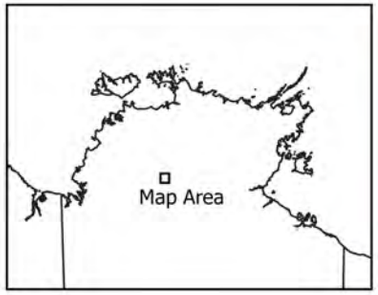
4.1.5 Disturbed and Cleared Habitat

The long history of disturbance from mining and pastoral activities have resulted in substantial modification of natural habitats within the study area with associated weed invasion, reduced ground cover and soil erosion (habitat unit 6). Approximately 9 ha of disturbed land (comprising 2.7 ha associated with the pit void, 1.6 ha associated with the former ROM pad and 4.7 ha occupied by a waste rock dump) remain from previous mining. Minor disturbance related to support infrastructure (access tracks, relocatable offices) also remains within the study area.

Figure 11. Land Units
Maud Creek Study Area

Base: GEOScience Australia/NTG
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses

Land Units

- 2b Sideslopes
- 2c Hills
- 2e Low Hills
- 6a Alluvial Plains
- 7e Drainage Systems

0 0.4 0.8 km

N

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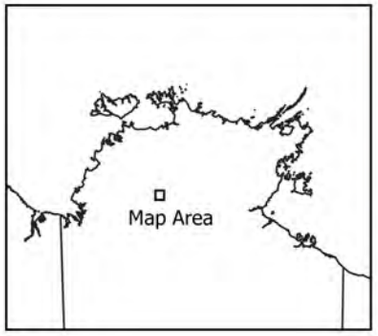
Table 5 Habitat categories and habitat units mapped within the Maud Creek study extent, indicating soils and corresponding land units and land systems

HABITAT CATEGORY	HABITAT UNIT	Soil description	Soils	Land unit	Land system
1	**SANDSTONE ESCARPMENT & PLATEAU**				
1	Rocky, rugged sandstone plateau surface, open woodland dissected by ravines. Slopes greater than 40%, boulder strewn and rocky crest	Skeletal soils and outcrop, minor red sands and earths	Rudosols	1a, 2a	Bld
2	**RISES AND HILLS**				
2a	Rugged terrain on sideslopes, low open woodland with slopes 15-40%	Very shallow or skeletal soils with outcrop	Rudosols	2b	Bkr, Bnd
2b	Rocky hills and rugged terrain on sideslopes, open woodland with slopes 5-15%	Soils generally shallow or skeletal	Rudosols	2c	
2c	Low hills, gently undulating terrain with slopes up to 5%	Soils either very shallow and gravelly or sandy	Tenosols	2e	
3	**ALLUVIAL PLAINS**				
3a	Undulating terrain, woodland to open woodland on sandy loams and red earths	Red, yellow and brown earths	Vertisols	6a	Vlc2
3b	Flat to undulating, low woodland to grassland on cracking clays	Lithosols with cracking clays on lower slopes and drainage floors	Vertisols	6a	
4	**DRAINAGE FEATURES**				
4a	Riparian corridor, major creeks and tributaries, woodland to open forest on deep sandy to gravelly soils	Poorly drained alluvial soils, often severely gullied	Tenosols Hydrosols	7e	Vlc2
4b	Minor and ephemeral creeks, woodland to open woodland often with severely eroded alluvials, deep and active gully systems.	Red, yellow and brown earths	Kandosols	7e	
4c	Broad drainage flats or seasonally ponded areas with very slight slopes, open shrubland to low open woodland on rarely channeled poorly drained soils	Red, yellow and brown earths	Kandosols, Hydrosols	7e	
5	**LIMESTONE PLAINS & RISES**				
5a	Hills, undulating limestone terrain, woodland to open woodland with scattered low to well-developed limestone outcrop and pavement	Loamy red earths	Kandosols	2d, 3a	Bdb, Bln
5b	Flat to gently sloping limestone plains and rises less than 2%, low woodland with minor surface limestone	Loamy red and yellow earths	Kandosols	4a1, 3c	Wrg
6	**DISTURBED or CLEARED**				

Figure 12. Maud Creek Habitat Map

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



Legend

- Maud Creek Study Area (ML)
- Nitmiluk National Park
- roads & tracks
- water courses
- Habitat Units

Habitat Categories

1. Sandstone Escarpment
2. Rises and Hills
3. Alluvial Plains
4. Drainage Features
5. Limestone Plains & Rises
6. Disturbed or Cleared

0 0.5 1 1.5 2 2.5 km

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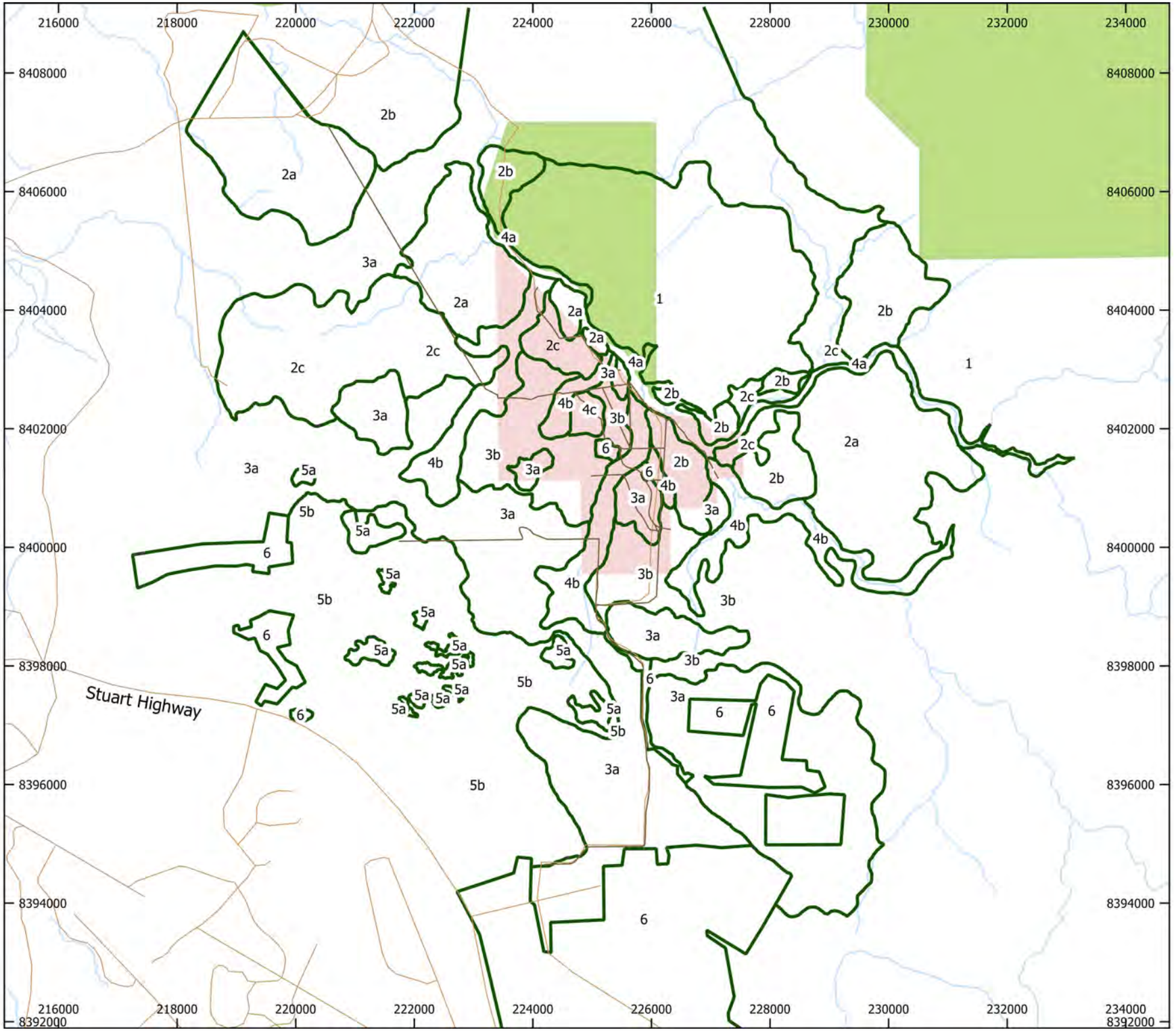


4.2 FLORISTICS, VEGETATION COMMUNITIES AND SIGNIFICANT FLORA SPECIES

4.2.1 Native Flora

The Northern Territory has over 4,300 species including approximately 702 endemic plants and 470 introduced weeds. All surveys conducted to date within the 1,272 ha Maud Creek study area have detected at total of 322 species of vascular plant drawing from 58 different families (Appendix 2.1). The combined results of all database searches, NTG records and the findings of this flora survey for the wider (459 km^2) study extent revealed a total of 2,495 flora records, comprising 575 flora species from 82 different families.

Combined data from all sources indicates that no plant species listed as threatened (endangered or vulnerable) under the Commonwealth *EPBC Act* have been recorded from within the Maud Creek study area, nor from within the wider study extent. Nine plant species listed as significant under the Northern Territory *TPWC Act* have been recorded within the study extent, with two significant species known to occur with the study area (Table 4, Figure 13; Figure 14). The two significant plant species *(Phyllanthus lacerosus* and *Tephrosia humifusa*) recorded within the study area are classified as either data deficient (DD) or near threatened (NT) respectively under NT legislation.

Table 6 Significant flora species under the Northern Territory *TPWC Act 1976* recorded within the study area (shaded) and study extent

Scientific Name	TPWC Act Status	NT Endemic	Restricted range	Study Area	Study extent	Habitat
Alysicarpus brownii	DD	Yes	No	Yes	Yes	3a – Alluvial plain
Phyllanthus prominulatus	DD	Yes	No	Yes	Yes	3a - Alluvial plain
Phyllanthus lacerosus	DD	No	-	Yes	No	2b - Rocky hills
Tephrosia humifusa	NT	Yes	Yes	Yes	No	3a - Alluvial plain
Sorghum macrospermum	NT	Yes	Yes	No	Yes	5a - Limestone hills
Terminalia aridicola	NT	No	No	No	Yes	-
Grevillea miniata	DD	No	No	No	Yes	-
Croton armstrongii	DD	Yes	No	No	Yes	-
Grevillea pyramidalis subsp. longiloba	DD	Yes	Yes	No	Yes	1 - Sandstone plateau
Hibiscus lobatus	DD	No	No	No	Yes	4a - Riparian

Near Threatened taxa are not yet classified as threatened, and exist either as small fragmented populations, or occur in populations thought to be in decline. A data deficient (DD) species is one which has been categorized by the International Union for Conservation of Nature (IUCN) as offering insufficient information for a proper assessment of conservation status to be made. All flora species of conservation significance listed in Table 4 are discussed in detail below (Section 4.2.3).

Fifteen endemic plant species are known from the study extent, with 10 endemic species recorded within the current study area (Appendix 2.1). A total of 22 species of non-native plants were recorded from within the study area during the 2018-2019 surveys, including one class A and eight class B/C weeds (Appendix 2.1, Table 5). Section 4.2.4 contains detailed discussion of introduced weeds.

4.2.2 Significant Vegetation Communities

Vegetation communities of conservation significance or ecological communities of high ecological importance do not occur within the Maud Creek study area. Although extensive sandstone communities protected within Nitmiluk National Park occur adjacent to the north-eastern boundary of the study area, no sandstone habitats or vine-forest communities (also likely to support threatened plants) occur within it. To the west of the study area, limestone plains and rises occupy the area between the Stuart Highway and the study area (Figure 12). Areas of well -developed limestone outcrop occur sporadically within this karst country (mapped as 5a in Figure 12) and represent habitat for significant vegetation such as vine forest on limestone outcrops and the near threatened species *Sorghum macrospermum*. A robust and tall grass, *S. macrospermum* is has a highly restricted distribution, and is known only from well-developed limestone outcrop in this habitat within the Katherine region (Figure 14).

Although no vegetation communities of conservation significance or habitats of high importance to significant plants were evident within the study area (which entirely encloses the current proposed project footprint), numerous disjunct patches of habitat unit 5a occur within the study extent (Figure 12). Development of an alternative access road alignment to the Stuart Highway (west of the study area) has the potential to impact or impinge on these areas, including sites that support significant vegetation associated with well-developed limestone outcrops.

4.2.3 Significant Flora

The NT Herbarium has primary responsibility for classifying the conservation status of native flora under section 29 of the *Territory Parks and Wildlife Conservation Act 1976.* Using IUCN criteria, species are classified according to threat using nine categories: Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (V), Endangered (E), Critically Endangered (CE), Extinct in the Wild and Extinct. Species considered as threatened are listed as either NT, VU, EN, CR, EW or EX.

Plant species listed as near threatened are thought to be in decline but are not yet classified as threatened. They have lower conservation value than those classified as critically endangered, endangered and vulnerable under IUCN and NT criteria and conservation categories. All threatened and data deficient (DD) species are considered significant species. Species classified as not evaluated (NE) have never been

assessed against IUCN criteria, usually because they are 'new' names, but could end up in any category once assessed.

During previous surveys of the Maud Creek lease area conducted in 1996 and 2007, no threatened plant species or ecological communities listed under the *EPBC Act 1999* were detected within the mining lease area, nor were any recorded along the proposed access road route. During the 2007 surveys one near threatened endemic (NT) species (*Tephrosia humifusa*) was recorded. This species was present in *E. tectifica* woodland habitat as a relatively common herb in ground stratum vegetation in low-lying habitats within the project area. Targeted searches for *T. humifusa* in 2018 and 2019 were unsuccessful.

Data searches revealed that one significant flora species has been recorded within the study area since the 2007 surveys were conducted (Table 6; Figure 13). This significant plant species (*Phyllanthus lacerosus*) is classified as data deficient (DD) under NT legislation. It is not and NT endemic species and is not considered to have a restricted distribution.

Descriptions of these species and details of its conservation significance are provided below. Due to their poorly known status, a substantial amount the information provided was obtained directly from Ian Cowie, principal botanist at the NT Herbarium.

4.3 SIGNIFICANT FLORA - THE STUDY AREA

4.3.1 Phyllanthus *Phyllanthus lacerosus*

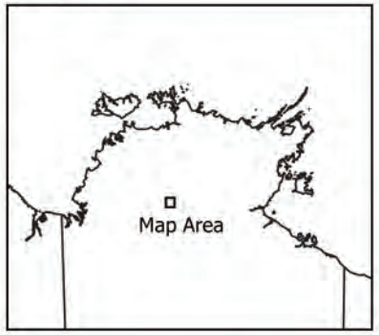
Conservation status (TPWCA): Data Deficient.

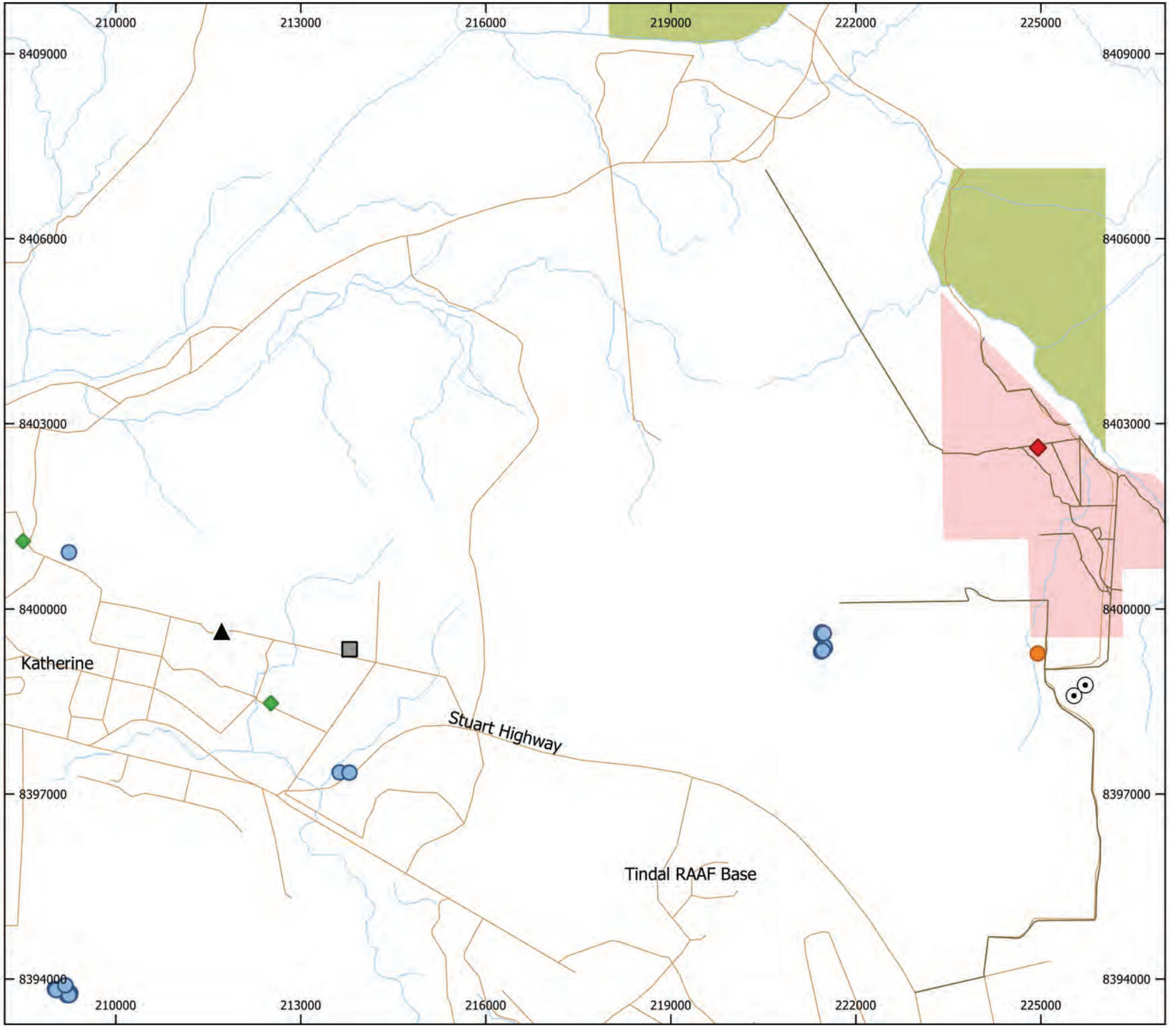
Phyllanthus lacerosus is an annual or perennial herb that is a data deficient species. It is not endemic to the NT. It mainly occurs on clay or cracking clay in shrubland, open woodland or grassland (e.g. Mitchell grass, *Sorghum plumosum*) in association with *Corymbia terminalis, Terminalia arostrata, Bauhinia cunninghamii* and *Vachellia pallidifolia*. Ian Cowie of the NT Herbarium notes that although the taxon is widespread across drier parts of monsoonal NT, WA and Qld, records are sparsely distributed. It is known from a number of conservation reserves, including Gregory National Park, Nitmiluk and Limmen NP. The subpopulations appear sufficiently large and well dispersed that the species is not prone to become endangered quickly by human activities or stochastic events (Ian Cowie pers. comm). Overall, the habitat of *P. lacerosus* appears secure, the species is not severely fragmented, and there appear to be no extreme population fluctuations or obvious threats. Within the study area, *Phyllanthus lacerosus* was recorded from the margin of cracking clay habitat (4c) by EcoScience in March 2019.

Figure 13. Significant Flora Species Records

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





National Parks
Maud Creek Study Area (ML)
water courses
roads and tracks

Significant Plant Species
- Alysicarpus brownii
- Croton armstrongii
- Grevillea miniata
- Hibiscus lobatus
- Phyllanthus lacerosus
- Phyllanthus prominulatus
- Sorghum macrospermum

0 0.5 1 1.5 km

N

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4.3.2 Hoary Pea *Tephrosia humifusa*

Conservation status (TPWCA): Data Deficient.

Tephrosia humifusa is the fourth data deficient species known from the study area where it occurs in Eucalyptus savanna, often on clayey soils derived from dolerite or siltstone. The Northern Territory specimen data held by the NT Herbarium for *T. humifusa* relate to seven different locations mainly within Kakadu and Arnhem Land recorded from 1973 to 2005. The current known distribution for this species appears to span an area from Maningrida to the southern end of Kakadu National Park. When it was recorded in 2007, the Maud Creek population represented a sixth location for this species and an extension of the known range. *T. humifusa* appeared to be locally common during previous surveys which were conducted after substantial wet season rainfall, occurring in a range of habitat types from low open woodland to low woodland and open forest along riparian corridors.

Targeted searches for *T. humifusa* during the current survey including examination of sites where it had previously been collected did not detect the presence of this species. This may indicate that the plant is relatively restricted in distribution or, being an annual species, may not have been detectable during the survey (particularly after a low rainfall wet season). It is also possible that *T. humifusa* was originally mis-identified (K. Brennan pers. com) as another species of very similar appearance (*Glycine* sp. Arnhem) which was recorded during targeted searches in 2019 of sites where *T. humifusa* was previously collected.

Recent surveys by the NT Herbarium also did not detect any *T. humifusa* (but recent significant flora surveys were concentrated on vine thicket and other rare habitats) and overall, the findings may indicate that this species is actually quite restricted in habitat and distribution.

4.4 SIGNIFICANT FLORA - THE STUDY EXTENT

4.4.1 Browns Moneywort *Alysicarpus brownii*

Conservation status (TPWCA): Data Deficient.

There has been some previous confusion regarding the distribution of *Alysicarpus brownii,* but it is considered an NT endemic. All confirmed records confined to the Northern Territory, where it is uncommon. It is currently listed as data deficient but not restricted in range. Conservation information drawn from Flora NT notes that while it has been recorded a number of times in the Gove area, other parts of its range have not been as intensively surveyed and little is known of abundance in those places. Based on habitat preferences (Eucalypt savanna and grassland) and past experience with other poorly known species, it is inferred that the species occurs at substantially more than the known locations (which

include Kakadu, the Darwin region, Nhulunbuy and Katherine) and future surveys may establish that it is more common than currently thought. Furthermore, the widely dispersed subpopulations provide some security from mining or stochastic events. Within the study area, two records of *Alysicarpus brownii* were obtained by DENR in 2019 from alluvial plain habitat (3a).

4.4.2 Phyllanthus *Phyllanthus prominulatus*

Conservation status (TPWCA): Data Deficient.

This taxon needs some taxonomic investigation and is regarded as a taxonomic data deficient species. It was first described by Hunter and Bruhl (1997), which cites four specimens collected from Kapalga, Munmalary, Berry Springs and Hayward Creek – which represents a wide distribution. It is recorded as occurring in sedgeland and in damp places in savanna vegetation. Unfortunately, a very recently published paper leaves its taxonomic status unresolved as there was insufficient material to work with. At this stage *P. prominulatus* retains its status as data deficient and therefore significant, however it appears unlikely to be threatened. Within the study area *Phyllanthus prominulatus* was recorded during DENR surveys in March 2019 on cracking clays associated with alluvial plains (habitat 3b).

4.4.3 Large-seed Sorghum *Sorghum macrospermum*

Conservation status (TPWCA): Near Threatened

Sorghum macrospermum is a restricted range Northern Territory endemic species currently listed as near threatened under TPWC legislation. *S. macrospermum* has been recorded from a number of locations within the study extent, several of which are very close to the study area boundary (Figures 13 and 14). At least 17 records of this native grass have been documented between 1947 and 2019. It only occurs in close proximity to well-developed limestone outcrops within the Katherine area, including recent records on the Maud Creek pastoral lease.

Due to its very restricted distribution and given the development pressures in the Katherine area, *Sorghum macrospermum* may qualify for a higher (i.e. threatened, vulnerable) status (Ian Cowie pers. com.). Numerous records of *S. macrospermum* were obtained from limestone habitat (5a) during recent plant surveys conducted by the Herbarium in March 2019. This species has not been observed within the study area and its known distribution is associated with several small limestone outcrops located outside the study area and similar habitat to the north of Katherine and near Tindal (Figure 13,14).

It should be noted that if the current project footprint changes or the location of the haul road deviates from the proposed existing access road, there is potential for this near threatened species to be impacted.

Currently the known locations of *S. macrospermum* are unaffected by the proposal for an underground mine transporting ore to an off-site processing facility using the existing roads.

4.4.4 Arid Terminalia *Terminalia aridicola*

Conservation status (TPWCA): Near Threatened

One record of the near threatened tree *Terminalia aridicola* was obtained from East Katherine in May 2019 by DENR. This species is known from six specimens recorded in Queensland and the single Katherine record in the Northern Territory. No further information on this species is available. It was not detected within the study area during recent surveys.

4.5 DATA DEFICIENT FLORA SPECIES

Conservation status (TPWCA): Data Deficient (*Grevillea miniata, Croton armstrongii, Hibiscus lobatus and Grevillea pyramidalis*)

A substantial amount of new information on the flora of the greater Katherine region has recently been collected by the Northern Territory Government (NTG) Department of Natural Resources (DENR) during surveys conducted as part of the NTG's *Mapping the Future* program from August 2018 to late 2019. New records for three data deficient species were obtained from close to Katherine (i.e. within the study extent but outside the study area) and are mapped in Figure 13.

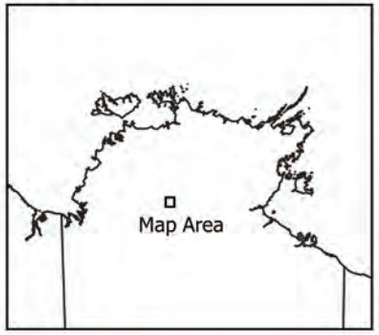
One record of *Grevillea miniata* from close to Katherine represents a new distribution record for this data deficient species, which has mainly been recorded to the west of Katherine. Although not an endemic species, *G. miniata* is considered significant and was recorded by DENR in woodland habitat between Katherine and Maud Creek in July 2019.

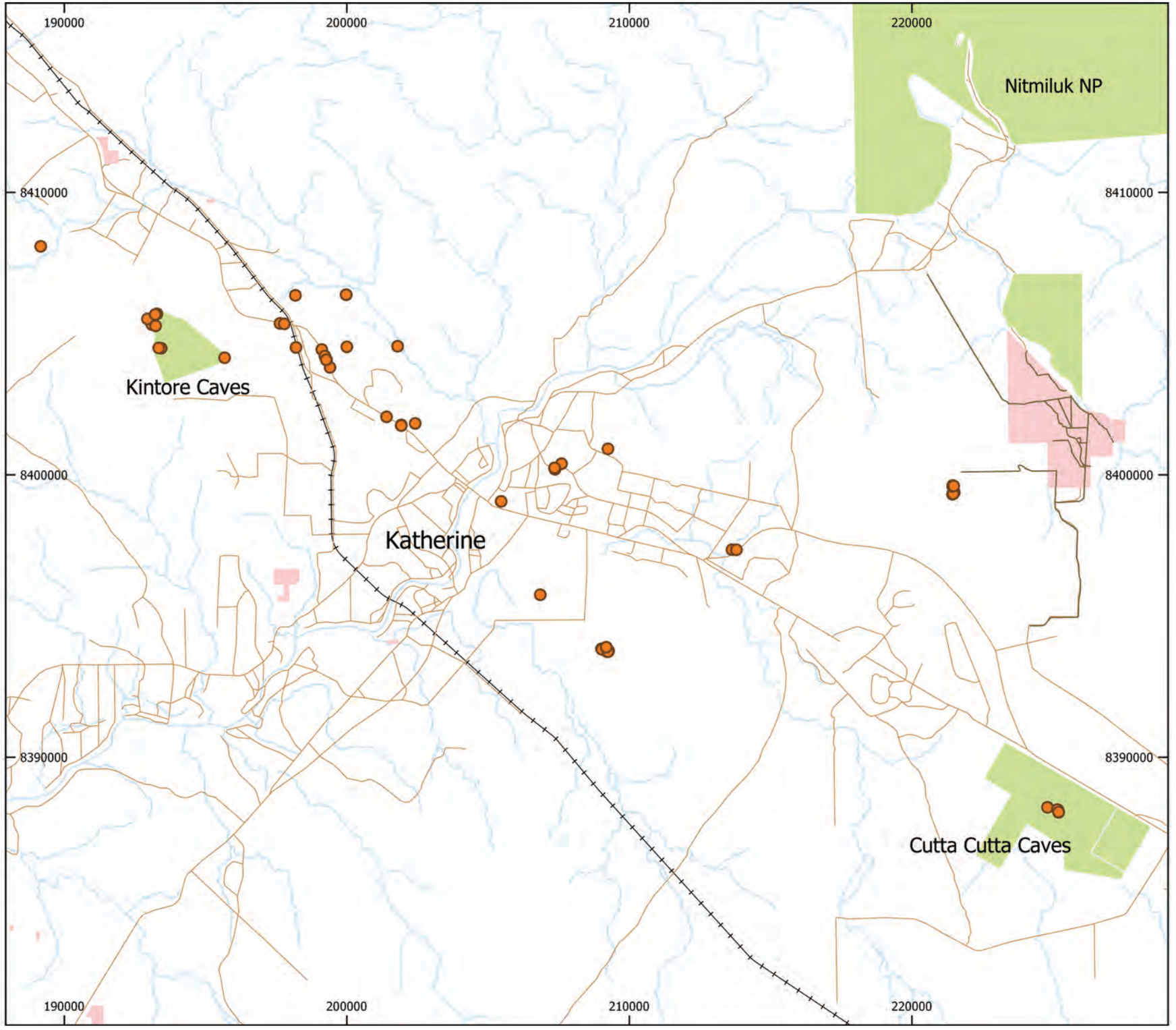
Croton armstrongii is an NT endemic species that has been recorded from Cobourg Peninsula and from two other locations north and west of Katherine. One record of *C. armstrongii* was obtained from woodland habitat in the Katherine East region in June 2019 by DENR. This species is poorly known and no descriptions or habitat details are available.

Figure 14. Sorghum macrospermum Collection and Observation Locations

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





Legend

- Maud Creek Study Area (ML)
- National Parks
- S macropsermum
- roads and tracks
- railways
- water courses

Source:
NTG Flora Atlas.
Map displays
all known collections and
observations
of S. macropsermum

0 1 2 3 km

N

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Hibiscus lobatus was also recorded near Katherine East during DENR surveys in July 2019 (Figure 13). It generally grows in coastal vine thicket or riparian vegetation on alluvial soil or laterite and is known from the Daly Basin and Darwin Coastal bioregions. It also occurs in SE Asia, but despite its wide distribution is considered a data deficient species. No records of this species are known from within the study area and the closest known location of *H. lobatus* is approximately 10 km from the study area.

Grevillea pyramidalis ssp. *longiloba* was recorded in 1990 from within rugged sandstone habitat to the north of the study area within the outlier of Nitmiluk National Park. This NT endemic is poorly known but does not have a restricted range. The sandstone plateau habitat where is occurs lies within the study extent but outside the study area. It has also been recorded from Elsey National Park.

4.6 SIGNIFICANT FLORA - GOULDIAN FINCH FOOD RESOURCE

4.6.1 Cockatoo Grass *Alloteropsis semialata*

Conservation status (LC): Least Concern

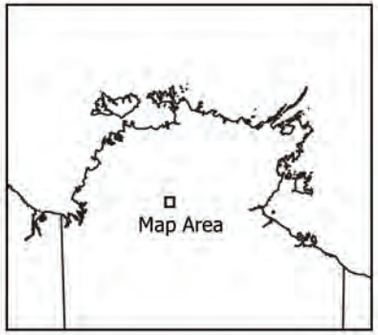
Grass species that constitute important food sources for Gouldian finches (primarily *Alloteropsis semialata* and to a lesser extent *Chrysopogon fallax*) were examined within the study area during a targeted wet season survey in January 2019. The search was focussed within a 2 km radius of the old mine, to ensure that the project footprint was carefully assessed (Figure 15). *A. semialata* was recorded at four locations during random traverses using an all-terrain vehicle, where it typically occurred in patch sizes exceeding 50 m x 100 m in association with *Themeda triandra* and *Cynodon* sp (Appendix 2-3).

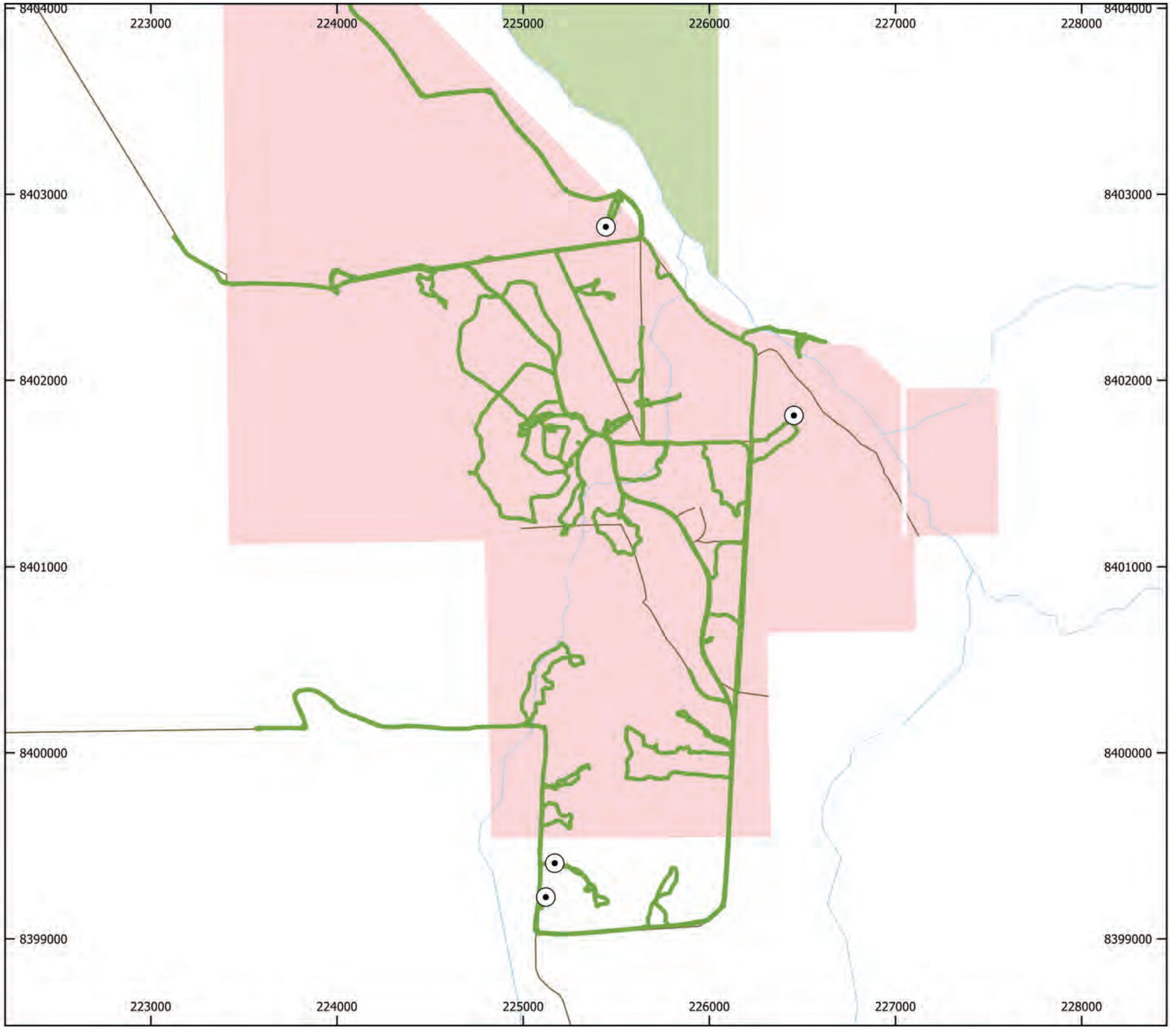
The distribution and density of *A. semialata* within the study area was noticeably lower than in other areas within the region. Heavy grazing appears to be the major factor contributing to a local reduction in the distribution and abundance of gouldian finch food plants. The highest density of *A. semialata* was observed in ungrazed paddocks in the NE corner of the study area (Figure 15). Recent fire and the lower than average wet season rainfall prior to January 2019 may also have affected grass density.

Figure 15. Gouldian Finch Feeding Grass Survey Transects

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





National Parks
Maud Creek Study Area (ML)
water courses
roads and tracks
Finch Grass Survey Transects
Alloteropsis semialata

0 0.1 0.2 0.3 0.4 0.5 km

N

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4.7 INTRODUCED FLORA

A total of 32 introduced species have been recorded during all surveys conducted within the study area to date. During surveys conducted by the team between 2018 and 2019, a total of 165 new weed records were documented for 23 different species. Nine species recorded from the study area are declared weeds under the NT Weed Management Act (Table 7, Figure 16; Figure 17). One class A (*Andropogon gayanus*) and eight class B weeds (*Azadirachta indica, Calotropis procera, Cenchrus polystachios, Mesophaerum suaveolens, Senna obtusifolia, Sida acuta, Sida cordifolia* and *Sida rhombifolia*) were detected within the study area. All of the above species are also class C weeds (not to be introduced).

Weeds are well established and abundant in the study area with dense infestations, especially along access roads, drainage lines and in disturbed areas. In addition to direct clearing for pastoralism, historic mining activity has contributed to the establishment and spread of a variety of grassy, broadleaf and woody introduced flora species. The highest weed densities recorded during the current surveys were located in close proximity to the previous mine (Figure 17).

In accordance with the *NT Weeds Management Act 2001*, landholders are required to make a reasonable attempt to control and prevent the spread of declared weed species. Under the Act, weeds are classified as class A (to be eradicated), class B (growth and spread to be controlled) and class C (not to be introduced) in all areas of the Northern Territory (all declared weeds are also declared class C).

Active weed control within the Maud Creek lease has been conducted in accordance with the NTMO 2019 Weed Action Plan (KL Gold 2019) which prioritises control of Class A and B species. Effective weed monitoring by KL Gold and control measures by the land manager under guidance from the Weeds Management Branch were implemented during the 2018 – 2019 season. Gamba grass, rubber bush and neem trees were part of a targeted program for control during 2018 while other weeds such as hyptis and mission grass were part of a broad scale control program.

The most significant weed recorded during the current survey was gamba grass (*Andropogon gayanus*), observed in 2018 as isolated clumps on the main access outside the mining lease. Gamba grass was the only Class A weed recorded during all previous surveys and it is also listed as a Weed of National Significance (WONS). Assessed as a very high risk weed in the Northern Territory, in 2009 the Australian Government listed gamba grass as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999.*

Table 7 Introduced flora recorded within the Maud Creek study area indicating declared status under the NT Weeds Management Act (shaded)

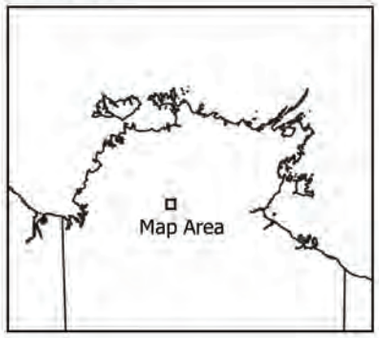
Family Name	Scientific Name	Common Name	Weed Management Act	EcoScience (2007)	Weeds Branch (2017)	EcoScience (2018-2019)	NRM InfoNet, VSD & Holtze (2019)
POACEAE	*Andropogon gayanus*	Gamba grass	A and C, Wons	x	x	x	x
APOCYNACEAE	*Calotropis procera*	Rubber bush	B and C	x	x	x	x
FABACEAE	*Senna obtusifolia*	Sicklepod	B and C	x	x	x	x
LAMIACEAE	*Mesosphaerum suaveolens*	Hyptis	B and C	x	x	x	x
MALVACEAE	*Sida acuta*	Sida, Spiny-head sida	B and C	x	x	x	x
MALVACEAE	*Sida cordifolia*	Sida, Flannel weed	B and C	x	x	x	x
MALVACEAE	*Sida rhombifolia*	Sida, Paddy's lucerne	B and C	x		x	x
MELIACEAE	*Azadirachta indica*	Neem	B and C	x	x	x	x
POACEAE	*Cenchrus polystachios*	Mission grass, perennial	B and C	x	x	x	
ASTERACEAE	*Bidens pilosa*	Bidens, Stick-tights	No	x			x
CONVOLVULACEAE	*Ipomoea triloba*		No	x			
FABACEAE	*Alysicarpus ovalifolius*	Alysicarpus, Buffalo clover	No	x		x	x
FABACEAE	*Alysicarpus vaginalis*	Alysicarpus, Buffalo clover	No			x	x
FABACEAE	*Calopogonium mucunoides*	Calopo	No	x			
FABACEAE	*Crotalaria goreensis*	Gambia pea	No	x	x	x	
FABACEAE	*Indigofera glandulosa*	Indigofera	No				x
FABACEAE	*Macroptilium atropurpureum*	Siratro	No	x			

Family Name	Scientific Name	Common Name	Weed Management Act	EcoScience (2007)	Weeds Branch (2017)	EcoScience (2018-2019)	NRM InfoNet, VSD & Holtze (2019)
FABACEAE	*Macroptilium lathyroides* var. *semierectum*	Phasey bean	No	x	x	x	x
FABACEAE	*Stylosanthes hamata*	Verano, Caribbean stylo	No	x	x	x	x
FABACEAE	*Stylosanthes viscosa*	Stylo	No	x		x	x
MALVACEAE	*Sida spinosa*	Prickly fanpetals	No			x	
PASSIFLORACEAE	*Passiflora foetida*	Wild Passionfruit	No	x	x	x	
PEDALIACEAE	*Sesamum indicum*	Sesame	No	x		x	x
POACEAE	*Bothriochloa pertusa*	Indian Bluegrass	No	x		x	x
POACEAE	*Chloris barbata*	Purple top chloris	No		x		
POACEAE	*Cenchrus ciliaris*	Buffel grass	No	x	x	x	
POACEAE	*Cenchrus pedicellatus*	Mission grass, annual	No	x		x	
POACEAE	*Digitaria bicornis*	Digitaria, Finger Grass	No				x
POACEAE	*Echinochloa colona*	Barnyard grass	No	x			x
POACEAE	*Pennisetum purpureum*	Elephant grass	No	x			
POACEAE	*Themeda quadrivalvis*	Themeda, Grader Grass	No	x		x	x
TILIACEAE	*Grewia asiatica*	Phalsa	No			x	

Figure 16. Class A and B Weed Distribution

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



National Parks
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roads and tracks

Inset A Access Road

Inset B Main Mining Lease

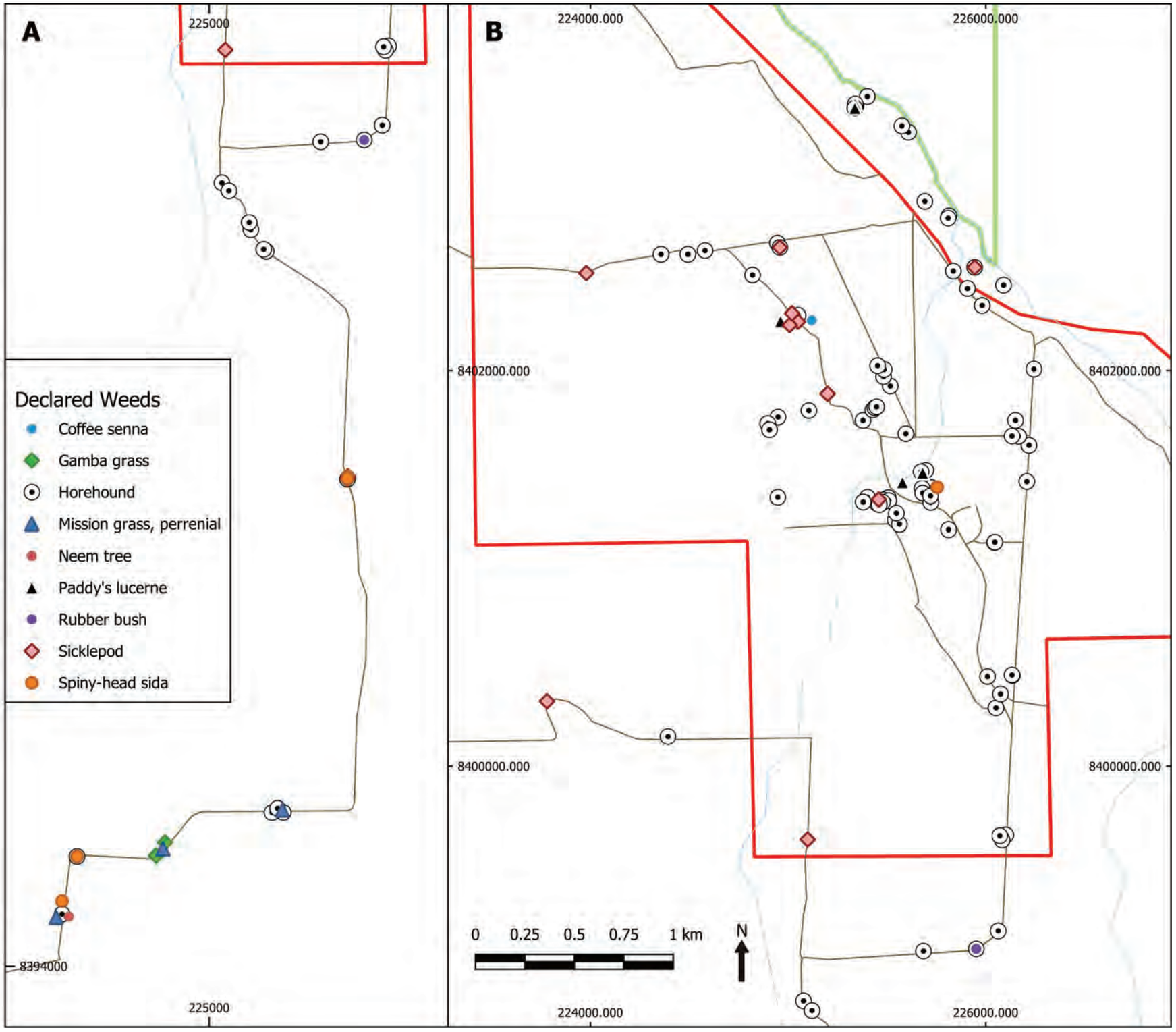

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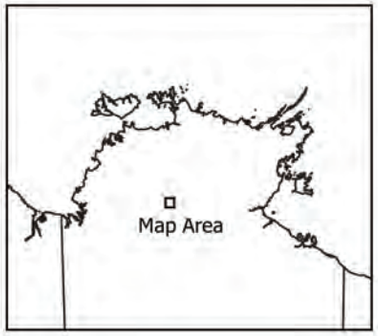
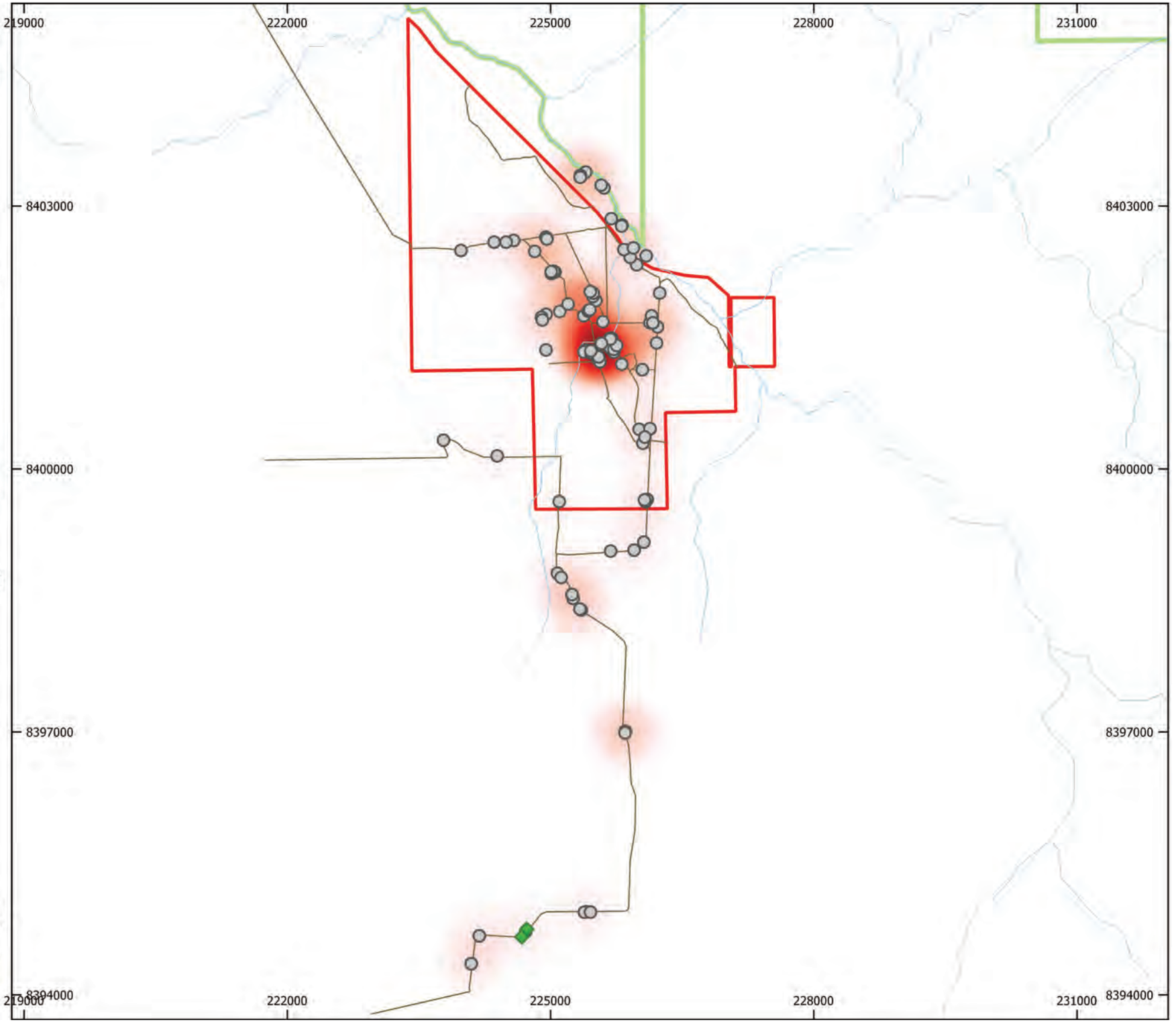
Figure 17. Density of Class A and B Weeds Maud Creek

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB





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Declared Weeds (Class A & B)
A
B

Heat map indicates density of declared weeds based on site observations

0 0.25 0.5 0.75 1 km

N

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In accordance with the NTMO MCPA 2019 Weed Action Plan (KL Gold 2019), active control of *A. gayanus* was undertaken on Maud Creek station during the 2018-2019 season by the land manager under guidance from the Weeds Management Branch. The control measures implemented were evidently highly successful and *A. gayanus* was not detected within the study area during 2019 surveys.

Hyptis or horehound (*Mesosphaerum suaveolens*) was by far the most abundant and extensively distributed weed within the study area. During the 2018-2019 surveys, hyptis comprised 57 % of all weed records This species occurred in all habitats within the study area, often in very dense infestations (Figure 16, Figure 17). Hyptis infestations varied from sparse plants interspersed with native vegetation to thick monospecific stands that clearly dominate the ground cover vegetation. Other Class B weeds were observed in much lower abundance and were not as widely distributed. Sicklepod *(Senna obtusifolia*) was the only other Class B species forming very dense stands in some parts of the study area. *Senna obtusifolia* can form extremely dense infestations, particularly in areas degraded by cattle but in general formed only sparse cover (comprising 7% of all weed records) and was substantially less abundant than hyptis (Figure 18).

Perennial mission grass (*Cenchrus polystachios*) is another highly invasive Class B species present within the study area, mainly associated with disturbed ground along tracks and dirt roads. *C. polystachios* was observed in low densities in only a few locations and together with annual mission grass (*C. pedicellatum*) comprised 4% of all weed records during the survey.

Previous land use within the study area has contributed to the current distribution and pattern of weed density. Dense weed infestations are common in highly disturbed areas associated with seasonal erosion along water courses, terrain disturbance from previous mining, around abandoned mining facilities, disturbance along roadsides and associated with stock watering points. Elsewhere, weed density ranged from isolated plants to scattered clumps and localised sparse to dense infestations (Figure 17).

In addition to the nine declared species recorded within the study area, recent surveys indicate that 17 other introduced plants occur at the site, including pasture species (e.g. *Bothriochloa pertusa*). During the 2018 survey, *Pennisetum purpureum* (elephant grass) was observed growing on the verge of the access road approximately 3 km south of the old mine. Elephant grass is native to Africa, forms robust clumps up to 6 m high, with each plant forming up to 3 million fertile seeds. It has been recorded as an invasive weed in many Indo-Pacific countries (Tropical Forages 2019) and may represent a significant risk as an invasive weed in the Top End. It is recommended that the distribution of *P. purpureum* be closely monitored and the spread of plants outside cultivated areas be actively controlled (Figure 18).

Figure 18 Dense hyptis (*Mesophaerum suaveolens*) is characteristic of large sections of the Maud Creek study area (left). Elephant grass (*Pennisetum purpureum*), cultivated on nearby farms (right) was observed growing and fruiting on the access road verge in 2018.

4.8 VEGETATION MAPPING

An objective of this assessment was to verify existing mapping and compile a revised map of the vegetation communities within the Maud Creek study area, with particular focus on vegetation located in close proximity to the project footprint. In accordance with the NVIS, a vegetation community is defined as an assemblage of plant species which are structurally and floristically similar and which form a repeating unit across the landscape.

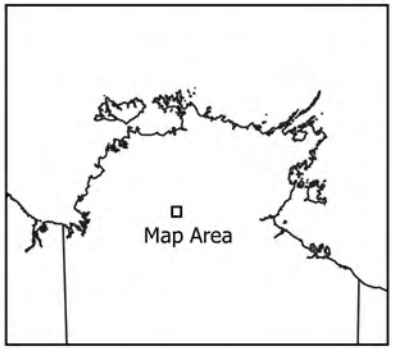
Revision of vegetation mapping identified 10 distinct vegetation mapping units (VMU's) distributed across three main habitats within the Maud Creek study area (Table 8, Figure 19). Distribution of VMU's within the study area are largely defined by local variations in topography, soils and drainage, commonly with vegetation occurring as recurring patterns of across the landscape, typically defined by the geological context of underlying land systems or land units. The 10 vegetation units mapped within the study area occur across substantial areas of the Maud Creek catchment (Figure 19) and the Katherine region (Cuff *et al.* 2011).

A revised map of the study extent is currently being compiled by the NT Department of Natural Resources which will enclose Maud Creek station and the study area. The greater Katherine region map will be completed in 2021 or late 2020 and will be based on the findings of extremely comprehensive flora assessment involving several hundred flora sites surveyed by the Northern Territory Herbarium and the Rangelands Management team. This mapping will provide the most comprehensive stratification of vegetation of the region and will be highly appropriate for future impact assessment for mining proposals within the Maud Creek area.

Figure 19. Maud Creek Lease Area Vegetation Units

Base: GEOScience Australia/NTMO
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



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Plan note: For detailed descriptions of vegetation mapping units refer to Table 8 and Appendix 1.1

0 0.25 0.5 km

N

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Legend
- 2a Eucalypt/Corymbia low open woodland on hills and rises
- 2b Eucalypt/Corymbia low open woodland on hills and rises
- 2c Eucalypt/Corymbia low open woodland on hills and rises
- 3a(i) Mixed species low to mid-high woodland on alluvial plains
- 3a(ii) Mixed species low to mid-high woodland on alluvial plains
- 3b(i) Mixed species low to mid-high woodland on alluvial plains
- 3b(ii) Mixed species low to mid-high woodland on alluvial plains
- 4a Mixed species low to tall open woodland on drainage lines
- 4b Mixed species low to tall open woodland on drainage lines
- 4c Low open Terminalia woodland to grassland on cracking clays
- 6a Disturbed - previous mining areas
- 6b Disturbed - open pit lake

224000 226000 228000
8404000 8402000 8400000

Table 8 Vegetation Mapping Units (VMU's) summary table with vegetation description, survey effort and total area (ha) within study area

VMU	VMU Sub Unit	DESCRIPTION	VEGETATION FORMATION & SOILS	LAND UNITS (NRMaps)	Previous Mapping (2007)	Sites	Study area (ha)
SANDSTONE ESCARPMENT & PLATEAU							
1	**Sandstone Plateau Low to Mid-high Woodland on the Arnhem Land Escarpment**						
	1a	*Eucalyptus phoenicea* and *Eucalyptus miniata*, low to mid-high open woodland on sandstone plateau.	Low open woodland on rugged rocky sandstone plateau surface	1a, 2a	N/A	N/A	0
	1b	Acacia spp. and mixed species low open shrubland to dry vine thicket in deep ravines	Shrubland on sandy valley floor to boulder strewn steep slopes with skeletal soils	1a, 2a	N/A	N/A	0
HILLS AND RISES							
2	***Eucalyptus and Corymbia* dominated low open woodland on hills and low rises**						
	2a	*Eucalyptus tectifica, Erythrophleum chlorostachys* and *E. dichromophloia* low open woodland on rocky sideslopes	Low open woodland on very shallow or skeletal soils with outcrop	2b	Map unit 7, 8		94.6
	2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid-high open woodland and woodland on rocky rises	Low open woodland on soils generally shallow or skeletal	2c	Map unit 4, 7	MC18, ES19, ES20	172
	2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills	Low woodland on very shallow and gravelly or sandy soils	2d, 2e	Map unit 4, 7	GT10, ES3, ES4	108.3
ALLUVIAL PLAINS							
3	**Mixed species Low Open Woodland to Mid-high Woodland on Alluvial Plains**						
3a	3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to low open woodland on sandy loams and red earths on undulating terrain	Low woodland on red, yellow and brown earths	6a	Map unit 2, 4, 5	MC2, MC1, MC2, MC7, MC11, MC17, GT4, GT5,GT12, GT13, ES33, ES34, ES37	205.5
	3a(ii)	*Corymbia foelscheana, Corymbia terminalis, C. confertiflora* and *E patellaris low open woodland to mid-high woodland on depositional plains*	Low open woodland on red, yellow and brown earths	6a	Map unit 9	MC1, MC6, MC14, MC19, ES35, ES36	67.6
3b	3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains	Low Woodland on lithosols with cracking clays on lower slopes and drainage floors	6a	Map unit 8	MC10,MC12, MC13,GT1,GT2, GT3, ,GT11, GT24	305
	3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains	Low woodland on low-lying flats on sandy soils	N/A	Map unit 3	MC3, MC20, GT7, GT26, ES10, ES25, ES26	19.5

VMU	VMU Sub Unit	DESCRIPTION	VEGETATION FORMATION & SOILS	LAND UNITS (NRMaps)	Previous Mapping (2007)	Sites	Study area (ha)
DRAINAGE FEATURES							
4	**Mixed Species Tall Woodland, Mid-high woodland to Low Open Woodland on Drainage Lines**						
	4a	*Corymbia bella, Melaleuca spp. and Terminalia platyphylla mid woodland on major drainage lines*	Riparian woodland on poorly drained alluvial soils, deep sandy to gravelly soils often severely gullied	7e	Map Unit 6	MC8, GT27, GT28, GT29, ES2, ES19, ES20, ES21, ES38	7.9
	4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid woodland to open woodland on minor creeks	Mixed species open woodland on river back plains & drainage floors on poorly drained soils with regular wet season flooding	7e, .8e	Map Unit 6	MC4, MC5, GT6, ES12, ES15,	135.6
	4c	*Terminalia platyphylla* low open woodland to grassland	Isolated low trees on cracking clay alluvial back plains	7e, 7d	Map Unit 1	MC9, ES8, ES25	41.6
LIMESTONE PLAINS & RISES							
5	**Eucalyptus tectifica, Corymbia foelscheana, E. miniata mid-high woodland to Low Open Woodland on limestone hills & plains**						
5a	5a(i)	*Eucalyptus tectifica, Corymbia foelscheana* and *Erythrophleum chlorostachys* low woodland over *Chrysopogon latifolius, Heteropogon contortus* tussock grassland.	Low woodland on loamy red earths	2d, 3a	N/A	N/A	0
	5a(ii)	*Ficus brachypoda* and *Gyrocarpus americanus* low woodland. Mixed species dry vine thicket on well-developed limestone outcrop including	Shrubland on moderate to well-developed limestone outcrop	2d	N/A	N/A	0
5b	5b	*Eucalyptus tetrodonta, E. miniata* and *Terminalia grandiflora* low woodland to woodland with perennial grass layer	Low woodland on well drained soils associated with limestone plains	4a1, 3c	N/A	N/A	0
DISTURBED / CLEARED							
6	Man-made clearings, infrastructure and rehabilitated areas						
	6a	Bare, no vegetation or partially cleared, natural or assisted rehabilitation	Disturbed area previous mining		Map unit 11	N/A	9
	6b	Water body	Disturbed area previous mining		Map unit 11	N/A	2.9

4.9 TERRESTRIAL FAUNA SURVEY RESULTS

4.9.1 Camera Trapping

Camera trapping within the Maud Creek study area recorded approximately 61,500 trigger events, with wildlife or stock identifiable in 23.3% of the trigger events. Camera traps recorded 24 vertebrate species, including three amphibian, three reptile, seven bird and eleven mammal species. A single large invertebrate species, and Darwin giant stick-insect (*Eurycnema osiris*), triggered a remote camera at one location.

The most frequently detected species, in terms of number of sites and triggers, was cattle (*Bos sp*.) (12,000 triggers), agile wallaby (*Notamacropus agilis*) (1,000 triggers), cane toad (*Rhinella marina*) (500 triggers) and northern nailtail wallaby (*Onychogalea unguifera*) (230 triggers). Several species listed as near threatened under Northern Territory legislation were detected on camera traps, including the northern brown bandicoot (*Isoodon macrourus*), northern brushtail possum (*Trichosurus vulpecula arnhemensis*) and northern nailtail wallaby. Several camera traps and all drift fence systems were disturbed by cattle within the site. The marbled frog (*Limnodynastes convexiusculus*) was the only species detected on a cork board but not on natural ground surfaces.

4.9.2 Woodland Birds and Threatened Bird Surveys

A total of 77 bird species were detected in woodland bird surveys conducted within the study area during the 2018 and 2019 surveys. This compares with 71 avian species recorded at the site during early surveys at the site in 1994-1997 (Dames & Moore 1994; Martin 1998) and 75 avian species recorded by EMS (2007b).

None of the birds detected during the 2018-2019 woodland bird surveys are listed as threatened under Northern Territory or Commonwealth legislation. Four bird species listed as near threatened under Northern Territory legislation were recorded, including the square-tailed kite (*Lophoictinia isura*), bush stone-curlew (*Burhinus grallarius*), Australian bustard (*Ardeotis australis*) and hooded parrot (*Psephotus dissimilis*) (Figure 22).

Call broadcast surveys conducted for the northern crested shrike tit (vulnerable, EPBC) and northern masked owl (vulnerable, EPBC) failed to detect these species within the study area.

Table 9 Camera Trap Results, Maud Creek Study Area 2019

Common Name	Scientific Name	Status NT	No Triggers	% Triggers
False Trigger/No ID			47187	76.684
Darwin Giant Stick-insect	*Eurycnema osiris*		5	0.008
Marbled Frog	*Limnodynastes convexiusculus*		5	0.008
Common Tree Frog	*Litoria caerulea*		13	0.021
Cane Toad	*Rhinella marina*		513	0.834
Gilbert's Dragon	*Lophognathus gilberti*		10	0.016
Shaded-litter Rainbow-skink	*Carlia munda*		17	0.028
Olive Python	*Liasis olivaceus*		5	0.008
Bar-shouldered Dove	*Geopelia humeralis*		11	0.018
Peaceful Dove	*Geopelia striata*		90	0.146
Wedge-tailed Eagle	*Aquila audax*		3	0.005
Pheasant Coucal	*Centropus phasianus*		5	0.008
Australian Owlet Nightjar	*Aegotheles cristatus*		35	0.057
Magpie-lark	*Grallina cyanoleuca*		24	0.039
Grey-crowned Babbler	*Pomatostomus temporalis*		2	0.003
Short-beaked Echidna	*Tachyglossus aculeatus*		3	0.005
Long-tailed Planigale	*Planigale ingrami*		10	0.016
Northern Brown Bandicoot	*Isoodon macrourus*	Near Threatened	8	0.013
Common Brush-tailed Possum	*Trichosurus vulpecula arnhemensis*	Near Threatened	42	0.068
Northern Nailtail Wallaby	*Onychogalea unguifera*	Near Threatened	237	0.385
Agile Wallaby	*Notamacropus agilis*		1067	1.734
Black Rat	*Rattus rattus*	Exotic	27	0.044
Cattle	*Bos sp*	Exotic	12076	19.625
Swamp Buffalo	*Bubalis bubalis*	Exotic	5	0.008
Donkey	*Equus callabus*	Exotic	131	0.213
Feral Cat	*Felis catus*	Exotic	3	0.005
			61534	100

4.9.3 Microchiropteran Bats

Incidental surveys for bats conducted in 2018-2019 within the study area added one species to the list of fifteen identified at the site by EMS (2007b). A single ghost bat (*Macroderma gigas*) was found impaled on a boundary fence within the study area in May 2018 (UTM 226 222.55 E, 8401 639.26 N). This record indicates that while there is no known roosting habitat within the study area, ghost bats are using the local habitat for foraging. Roosts are likely to occur in adjacent areas of sandstone escarpment or limestone karst.

4.9.4 Gouldian Finch Feeding Grasses

Surveys for grass species that constitute important food sources for gouldian finches (primarily *Alloteropsis semialata* and to a lesser extent *Chrysopogon fallax*) were undertaken during January 2019.

Gouldian finches rely on the production of seeds by a succession of grass species throughout the year, with annual grasses (especially native sorghums *Sarga* spp.) of most importance during the dry season. The availability of these annual seeds declines steadily through the dry season and the first significant rains of the wet season causes the remaining reserves to germinate or be washed away. Several grass species respond quickly to rain in the early dry season rain (including cockatoo grass *Alloteropsis semialata* and golden beard grass *Chrysopogon fallax*), and thus provide a critical supply of food when other grass seeds are scarce (Dostine & Franklin 2002). This early wet season period is thought to be the time of potentially critical food shortage for gouldian finches (Dostine et al. 2001). The early wet season grasses available during this period have been shown to suffer reduced seed production following intense fires and grazing (Andersen et al. 2005), thus compounding what was a natural period of food resource shortage. The reduction of available seed in early wet season seeds may have affected gouldian finches more than other grass finches because they are relatively more restricted to grass seed. Other species supplement their diets with additional food items such as seed arils and invertebrates during the critical food shortage period (Dostine and Franklin 2002).

Alloteropsis semialata was recorded at four locations, typically occurring at patch sizes exceeding 50 m x 100 m in association with *Themeda triandra* and *Cynodon* sp (Figure 15; Appendix 2-3).

The distribution and density of *A. semialata* within the study area was noticeably lower than in other areas within the region. Heavy grazing appears to be the major factor contributing to a local reduction in the distribution and abundance of gouldian finch food plants, as the highest density was observed in ungrazed paddocks in the NE corner of the study area. Recent fire and the lower than average wet season rainfall prior to January 2019 may also have affected grass density. Gouldian finches have not been recorded within the Maud Creek study area to date, however the close proximity of sightings to the north and east indicate that this highly mobile species is likely to occur within the study area. The management of areas of important feeding grasses, particularly *Alloteropsis semialata*, should be considered in the context of their importance for local gouldian finch populations.

4.9.5 Migratory Species

Based on surveys conducted within the Maud Creek study area, local habitats do not qualify as internationally or nationally significant for migratory birds.

4.10 AQUATIC FAUNA SURVEY RESULTS

4.10.1 Freshwater Fishes

A total of seventeen freshwater fishes have been recorded within the study area and adjacent habitats on Maud Creek during the current and previous assessments (Table 10). Previous fish surveys in the Katherine River have reported seventeen species near the Maud Creek junction (Midgley 1980) and eighteen species were found in a fish kill near Donkey Camp pool on the Katherine River in 1987 (Martin 1989). Previous surveys, review of existing data and EPBC protected matters reports have not identified threatened or significant freshwater fish species in the study area or adjacent areas of Maud Creek.

Table 10 Freshwater Fishes of the Maud Creek Study Area (Maud and Gold Creeks)

Common Name	Scientific Name	Martin 1996	EMS 2007a	EMS 2018
Ox-eye Herring	*Megalops cyprinoides*	X		
Bony Bream	*Nematolosa erebi*	X	X	X
Blue Catfish	*Neoarius graeffei*	X		
Yellow-finned Catfish	*Neosilurus hyrtlii*	X	X	
Freshwater Longtom	*Strongylura krefftii*		X	
Red-tailed Rainbowfish	*Melanotaenia splendida australis*	X	X	X
Fly-specked Hardyhead	*Craterocephalus stercusmuscarum*	X	X	X
Sail-fin Glassfish	*Ambassis agrammus*	X	X	
Sooty Grunter	*Hephaestus fuliginosus*	X	X	X
Spangled Grunter	*Leiopotherapon unicolor*	X	X	X
Barred Grunter	*Amniataba percoides*	X	X	X
Mouth Almighty	*Glossamia aprion*	X	X	
Sevenspot Archerfish	*Toxotes chatareus*	X	X	
Flathead Goby	*Glossogobius giurus*	X	X	
Sleepy Cod	*Oxyeleotris lineolata*		X	
Giant Gudgeon	*Oxyeleotris selheimi*		X	
Northern Purple-spotted Gudgeon	*Mogurnda mogurnda*		X	X
Total Species	17	13	15	7

4.10.2 Aquatic Macroinvertebrates

Macroinvertebrate sampling was conducted in early June 2018 at four sites within the Maud Creek lease and Maud Creek. Two sites on Gold Creek (M5 and M6) were not sampled as they were dry during the sampling period, and sites on Gold Creek had ceased to flow. Consequently, riffle samples were on collected at two sites on Maud Creek (M3 and M4).

Figure 20 Aquatic fauna sampling sites on Gold Creek (left) and Maud Creek (right) in June 2018

During the 2018 aquatic macroinvertebrate sampling period, a total of 42 family level or higher order groups (89 individual taxa) were recorded in edge and riffle samples, not including unidentified taxa and life forms (e.g. larval and pupal stages) of the same taxa (Table 11). This compares with 30 families (50 taxa) recorded at six sites at the Maud Creek lease in 2007 (EMS 2007a). Macroinvertebrate taxa diversity was slightly higher in 2018 when compared to sampling conducted in 2007 (Table 12). Additional data would be required to confirm an improving trend in instream habitat quality at the site, however observations indicate some improvements in water quality, potentially due to a decline in the number of water buffalo stocked on the station.

Distance based linear modelling using AIC to identify important habitat factors influencing macroinvertebrate community structure indicated that levels of disturbance by cattle and other feral animals was the most important habitat variable, followed by stream velocity, instream habitat structure and abundance of aquatic macrophytes (Table 13). Variation in these variables was most prominent for sites on Gold Creek and Maud Creek, the latter tributary having lower levels of cattle disturbance, high flow rates and low levels of aquatic macrophytes during the survey period. Important water chemistry parameters influencing macroinvertebrate composition between sites based on linear modelling included surface water salinity and sulphate related measures and pH (Table 13). Again, these parameters are likely to indicate variation between conditions in Gold Creek and sites on the main Maud Creek channel.

Table 11 Freshwater Macroinvertebrates of Maud Creek – Family Level, June 2018

Macro Site	M1	M2	M3	M4	M3R	M4R	Total
Habitat	Edge	Edge	Edge	Edge	Riffle	Riffle	
Tributary	Gold Ck	Cold Ck	Maud Ck	Maud Ck	Maud Ck	Maud Ck	
Tubificidae	0	9	28	14	3	7	61
Hydridae	0	18	0	0	0	0	18
Ameronthridae	0	0	9	19	5	15	48
Hygrobatidae	0	1	0	0	1	6	8
Hydrodromidae	0	0	2	3	0	0	5
Limnesiidae	1	17	0	0	0	2	20
Unionicolidae	0	0	4	2	6	7	19
Acarina	2	0	0	1	4	3	10
Atyidae	0	0	0	1	0	0	1
Palaemonidae	0	0	2	0	0	0	2
Caenidae	98	74	31	32	52	16	303
Baetidae	14	3	35	48	7	2	109
Leptophlebiidae	0	0	0	0	10	5	15
Epiproctophora	1	3	2	1	4	0	11
Gomphidae	0	0	1	1	5	1	8
Libellulidae	32	15	9	4	3	11	74
Zygoptera	0	0	2	0	0	0	2
Coenagrionidae	11	0	0	5	0	0	16
Protoneuridae	0	0	2	4	0	0	6
Corixidae	1	0	0	0	0	0	1
Gerridae	1	0	2	0	0	0	3
Nepidae	0	1	0	0	0	0	1
Pleidae	4	3	0	1	0	0	8
Veliidae	1	0	0	0	0	0	1
Hydrophilidae	0	2	0	0	0	3	5
Dytiscidae	8	0	0	2	0	0	10
Elmidae	0	0	10	19	128	91	248
Hydraenidae	0	1	0	0	0	0	1
Ceratopogonidae	12	18	0	7	14	10	61
Chironomidae	65	76	94	40	48	45	368
Culicidae	1	3	1	1	0	0	6
Simuliidae	0	0	0	1	12	98	111
Tabanidae	0	0	0	0	3	2	5
Empididae	0	0	0	0	2	3	5
Hydroptilidae	2	2	5	2	7	14	32
Ecnomidae	0	0	1	0	3	0	4
Hydropsychidae	0	0	0	0	12	53	65
Leptoceridae	0	0	11	23	5	0	39
Philopotamidae	0	0	0	0	13	64	77
Crambidae	0	0	0	0	0	1	1
40	254	246	251	231	347	459	1788

Table 12 Freshwater Macroinvertebrates Edge Taxa Diversity and Abundance, 2007 and 2018

Site Code	Drainage Line	Year	Habitat Type	Diversity (Shannon)	No of Taxa	No of individuals
				H'(loge)	S	N
M1-07	Gold Creek	2007	Edge	1.540658	11	201
M1-18	Gold Creek	2018	Edge	1.79851	16	254
M2-18	Gold Creek	2018	Edge	1.943517	16	246
M3-07	Maud Creek	2007	Edge	1.58762	15	219
M3-18	Maud Creek	2018	Edge	2.090692	19	251
M4-07	Maud Creek	2007	Edge	2.259659	21	212
M4-18	Maud Creek	2018	Edge	2.388557	22	231
M5-07	Gold Creek	2007	Edge	1.763689	12	207
M5-18	Dry - not sampled	2018				
M6-07	Gold Creek	2007	Edge	1.597845	10	211
M6-18	Dry - not sampled	2018				

Table 13 Results of distance based linear modelling (DISTLM, stepwise, AIC) results for fitting environmental variables (spatial and habitat and surface water chemistry parameters) to 2018 edge macroinvertebrate data Bray-Curtis similarity (marginal tests). Top five results for surface water chemistry and habitat variables.

Surface Water Chemistry Variables				
Variable	SS(trace)	Pseudo-F	P-value	Proportion
Cl- mg/L	2285.6	2.1683	0.0431	0.52019
SO_4^{2-} (Filtered) mg/L	2285.6	2.1683	0.0431	0.52019
pH Field	2292.9	2.1826	0.0441	0.52183
TSS mg/L	1735.4	1.3056	0.0857	0.39496
TDS mg/L	2274.4	2.1462	0.1238	0.51763
Habitat Variables				
Variable	SS(trace)	Pseudo-F	P-value	Proportion
Bank Disturbance by Cattle	2149.5	1.9155	0.078	0.48922
Bank Disturbance other Feral Animals	2149.5	1.9155	0.0806	0.48922
Velocity m/sec	2295.9	2.1887	0.0848	0.52253
100 m REACH Other Substrate % (pool)	2268.6	2.135	0.1224	0.51632
100 m REACH Macrophytes %	2252.7	2.1042	0.1552	0.51269

5.0 SIGNIFICANT TERRESTRIAL FAUNA SPECIES

5.1 EPBC LISTED SPECIES – ENDANGERED AND VULNERABLE

Several EPBC listed threatened species have been detected within or in the area surrounding the Maud Creek mining lease area (Figure 21). Species that have been detected within the lease or have been identified in data searches from recent or historical records in the Tindal/Maud Creek region are discussed.

5.1.1 Northern Masked Owl *Tyto novaehollandiae kimberli*

Status: Vulnerable (EPBC Act)

Distribution: The former distribution of the northern masked owl covered broad areas of the northern Australian monsoonal tropics, with populations extending to the Northern Territory Gulf (Garnett *et al.* 2011).

Maud Creek Lease Area: There are no recent or historical records of the northern masked owl from the Maud Creek lease area. Targeted call broadcast surveys in 2019 failed to detect northern masked owls within the lease area. The nearest masked owl records are in the southern Nitmiluk National Park.

Habitat Associations: Open woodland, open forest, riparian woodland.

Northern masked owls mainly occur in tall open eucalypt forests, but may forage in more open vegetation types and roost in monsoon rainforests (Garnett *et al.* 2011).

5.1.2 Partridge Pigeon *Geophaps smithii smithii*

Status: Vulnerable (EPBC)

Distribution: Partridge pigeons have declined across much of the lower rainfall components of its former range in the Northern Territory (Woinarski 2006c).

Maud Creek Lease Area: This species is readily detected during observational surveys in woodland habitats or when drinking at water points (DSEWPC 2011b). Despite this, partridge pigeons have not been detected in the Maud Creek lease during numerous surveys and bird monitoring programs (Dames & Moore 1994; Dames & Moore 1999; Martin 1997; Martin 1998; EMS 2007b, current survey). However, the high mobility of this species accompanied by the presence of suitable habitats in the lease and regional records suggests that it may occur in the lease.

Habitat Associations: Open forest and woodland, grasslands.

Partridge pigeons occur principally in eucalypt open forests and woodlands, with tussock grassland ground cover (Woinarski 2006c).

5.1.3 Red Goshawk *Erythrotriorchis radiatus*

Status: Vulnerable (EPBC Act)

Distribution: The red goshawk is patchily distributed across sub-coastal areas of the Gulf of Carpentaria (Garnett *et al.* 2011).

Maud Creek Lease Area: There is a single record of the red goshawk from the Maud Creek Lease Area (EMS 2007b). Nesting sites have not been detected. Red goshawks can be secretive and difficult to detect during observational surveys, but they can be readily detected through locating and identifying nests (DSEWPC 2011b). Assessments of all occupied raptor nests over detected in riparian habitats between 2018 and 2019 (12 field days) in the Maud Creek study area failed to detect red goshawks. Commonwealth guidelines for threatened bird surveys recommend 80 hours/10 field days of raptor nest searches to detect red goshawk in an area (DSEWPC 2011b).

Habitat Associations: Open forest, open woodland, riparian forest.

Red goshawks primarily occur in tall open eucalypt forest and riparian areas, including paperbark forest and gallery forests, where they predominantly hunt birds (Woinarski 2006b). Red goshawk territory size is very large and can cover an area up to 200 km^2 (Woinarski 2006b).

5.1.4 Northern Crested Shrike-tit *Falcunculus frontatus whitei*

Status: Vulnerable (EPBC Act)

Distribution: Northern rested shrike-tit have a restricted and sparse distribution across the Northern Territory (Robinson & Woinarski 1992).

Maud Creek Lease Area: There are no recent or historical records of the northern crested shrike-tit from the Maud Creek lease area. The nearest record is approximately 8 km to the west (NT Fauna Atlas). Other sightings in the region are associated with the Central Arnhem Highway (30 km south-east).

Habitat Associations: Open woodland and open forest, melaleuca swamp forest.

The northern crested shrike-tit has been observed in a range of habitats in the Northern Territory (Woinarski & Robinson 1992; Barnard 1914), including open forest and woodlands dominated by *Eucalyptus tectifica* and *Corymbia confertifolia* (DSEWPC 2011b; Woinarski & Robinson 1992).

5.1.5 Gouldian Finch *Chloebia gouldiae*

Status: Endangered (EPBC Act)

Distribution: The gouldian finch is found in northern Australia from the Kimberley Region of Western Australia to the north of the Northern Territory to Cape York Peninsula (O'Malley 2006).

Maud Creek Lease Area: Gouldian finches have not been observed within the lease area during recent and historical surveys. However, the species has been reliably recorded in similar habitat to the north and east of the lease in recent years. Large areas of the Maud Creek lease area support suitable foraging areas and watering points for gouldian finches, including patches of key riparian grasses (e.g. *Alloteropsis semialata*).

Habitat Associations: Open woodland and open forest

Suitable foraging habitat for this species occurs across broad areas of the Maud Creek lease and adjacent areas, including extensive woodlands supporting grass species providing seed resources during the wet and dry season, as well as many potential watering points on minor drainage lines and hillslope seeps.

Gouldian finches nest almost exclusively in Eucalypt hollows, and in the eastern Northern Territory the most important nesting sites are snappy gum (*Eucalyptus leucophloia*) (Tidemann *et al.* 1999). Snappy gum woodlands are not present within the main lease area.

5.1.6 Northern Quoll *Dasyurus hallucatus*

Status: Endangered (EPBC Act)

Distribution: The northern quoll formerly had a broad distribution across northern Australia from the Pilbara region of Western Australia to southern eastern Queensland. However, this species is now absent from large areas of its former range, particularly in the Northern Territory and Queensland where fire regimes and cane toads have impacted populations (Ujvari 2013; Oakwood 2008; Woinarski *et al.* 2008).

Maud Creek Lease Area: There are no known recent or historical records of the northern quoll from the Maud Creek lease area. There is an historical (pre-cane toad arrival) record from the Cutta Cutta caves to the west.

Northern quolls have not been recorded during fauna surveys at the Maud Creek lease over a 30-year period, which have incorporated small mammal live trapping, spotlighting, observations of tracks, scat collections and camera trapping (Dames & Moore 1994; Dames & Moore 1999; Martin 1997; Martin 1998; EMS 2007b, current survey). Northern quolls are readily detected at sites where populations persist

using combinations of camera traps with suitable baits, spotlight surveys and live trapping (DSEWPC 2011). The combination of the low number of pre-1990 records in the region and the absence of observations or captures during surveys covering a 30-year period suggest that the northern quoll is locally extinct or present at very low numbers in the region.

Habitat Associations: Open woodland, open forest, sandstone, riparian forests, limestone.

The northern quoll occurs in a wide range of eucalypt open forest and woodland habitats, however the most suitable refuge habitats appear to be rocky areas (Woinarski & Hill 2012).

5.1.7 Ghost Bat *Macroderma gigas*

Status: Vulnerable (EPBC Act)

Distribution: Ghost bats occur across a broad area of tropical northern Australia (TSSC 2016b).

Maud Creek Lease Area: One record of a ghost bat caught on a barbed wire fence within the Maud Creek lease. Roost sites have not been identified in the main lease area but are potentially present in limestone areas to the west. Ghost bats are known to roost in low numbers at the Cutta Cutta caves to the south of Tindal RAAF base.

Habitat Associations: Open woodland, forest and grassland (foraging). Limestone and sandstone caves, old underground mines (roosting).

Ghost bats hunt in a broad range of forest, woodland and grassland habitats in northern Australia (TSSC 2016b). During the day they generally roost in deep natural caves or disused mines with a relatively stable temperature of 23°-28°C and a moderate to high relative humidity of 50-100 percent (TSSC 2016b).

5.2 NORTHERN TERRITORY LISTED SPECIES - VULNERABLE

5.2.1 Mertens' Water Monitor *Varanus mertensi*

Status: Vulnerable (Northern Territory TPWC Act)

Distribution: The Mertens' water monitor is a semi-aquatic species which occurs across the monsoonal tropical regions of northern Australia (Ward *et al.* 2012b). The primary threatening process for this species is lethal toxicity following consumption of cane toads. The species has suffered a marked decline in areas where toads have invaded (Ward *et al.* 2012b).

Maud Creek Lease Area: Sighted on Gold Creek during surveys conducted in the mid-1990s (Martin 1998). Suitable habitats are present along drainage lines within the study area, and this species is likely to persist in the local area based on regional records.

Habitat Associations: Riparian habitats, water holes, dams.

Mertens' water monitors are strongly associated with swamps and lagoons, stream and river margins, riparian forest and wetland habitats, where they feed on fish, frogs, insects and other small vertebrates (Ward *et al.* 2012b).

5.3 MIGRATORY SPECIES

Migratory species occurring within the Maud Creek lease were reviewed with reference to the Referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment 2015a), the Wildlife Conservation Plan for Migratory Shorebirds (DOTE 2015b) and Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DOTE 2015c). Significant migratory species and their important habitats as defined by these documents have not been recorded within the Maud Creek study area.

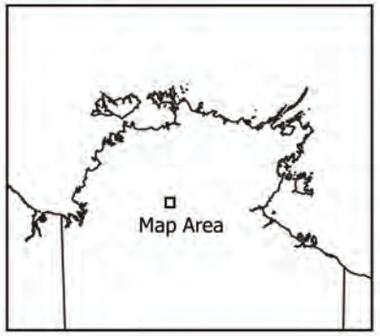
5.4 NEAR THREATENED FAUNA SPECIES

Ten species listed as near threatened in NT government legislation (*TPWC Act 1976*) have been recorded within the Maud Creek lease during current or recent (2007) surveys or historical surveys (Figure 22, Table 14). A summary of records and habitat associations for near threatened fauna species are indicated in Table 14. A notable record of the Arnhem sheathtail bat (*Taphozous kapalgensis*) was obtained echolocation calls from the Maud Creek lease in 2007. This record significantly extends the range of this species and is potentially the most inland record, with all other records situated in coastal plains within 60 km of the coast.

Figure 21. Endangered & Vulnerable Fauna Species Records

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



National Parks
Maud Creek Study Area (ML)
water courses
roads and tracks

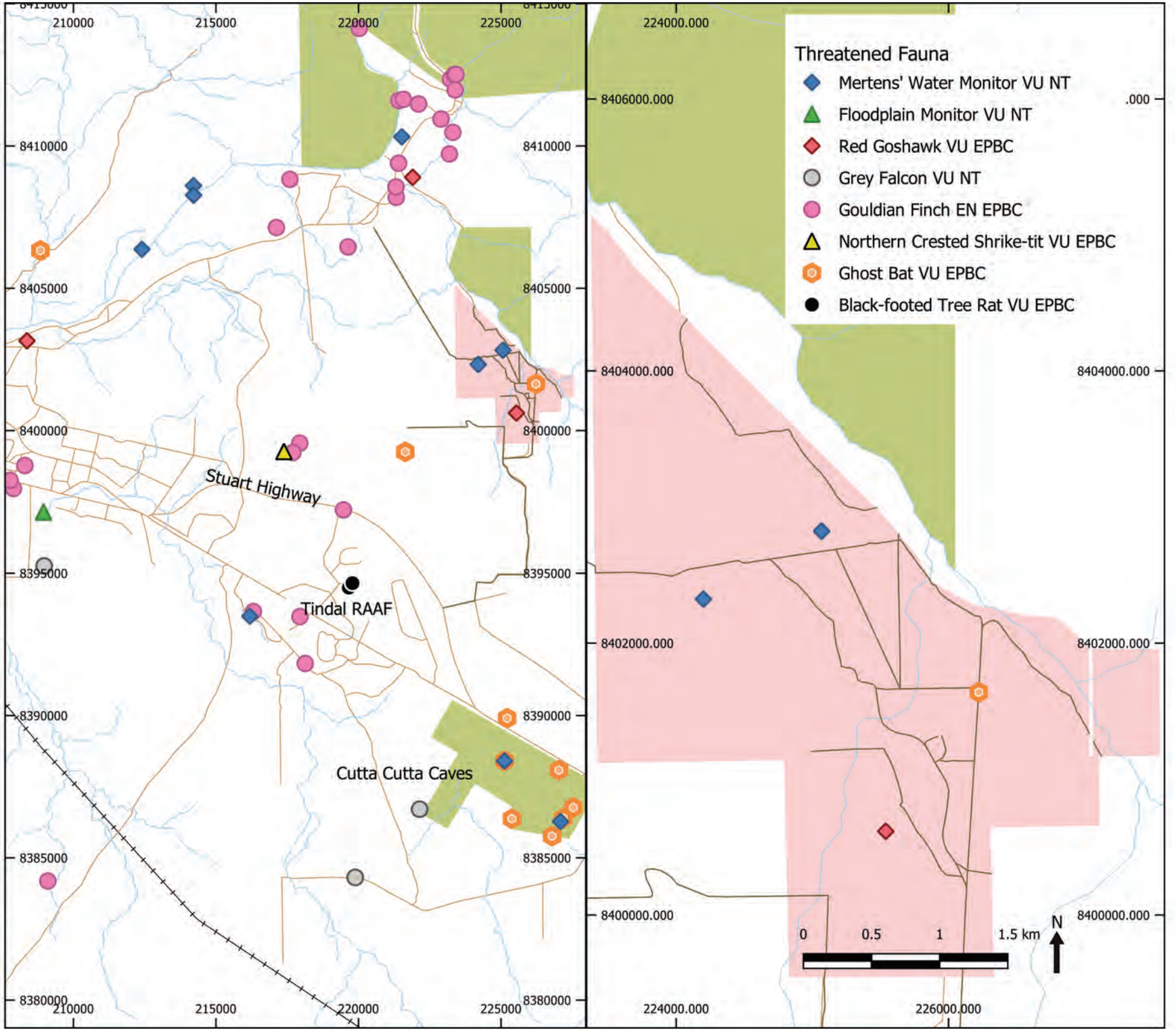


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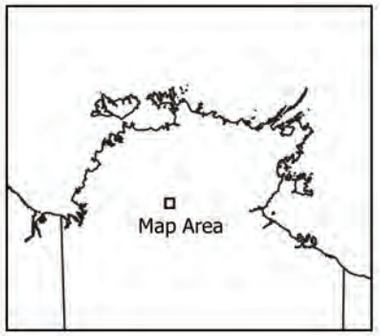
Figure 22. Significant Fauna Species Records

Base: GEOScience Australia
Zone 53/GDA94 UTM

ems@ems.eco
Client: KLG/NTMO
Project: Maud Creek
Date: 20 FEB 2020
Author: PB



National Parks
Maud Creek Study Area (ML)
water courses
roads and tracks

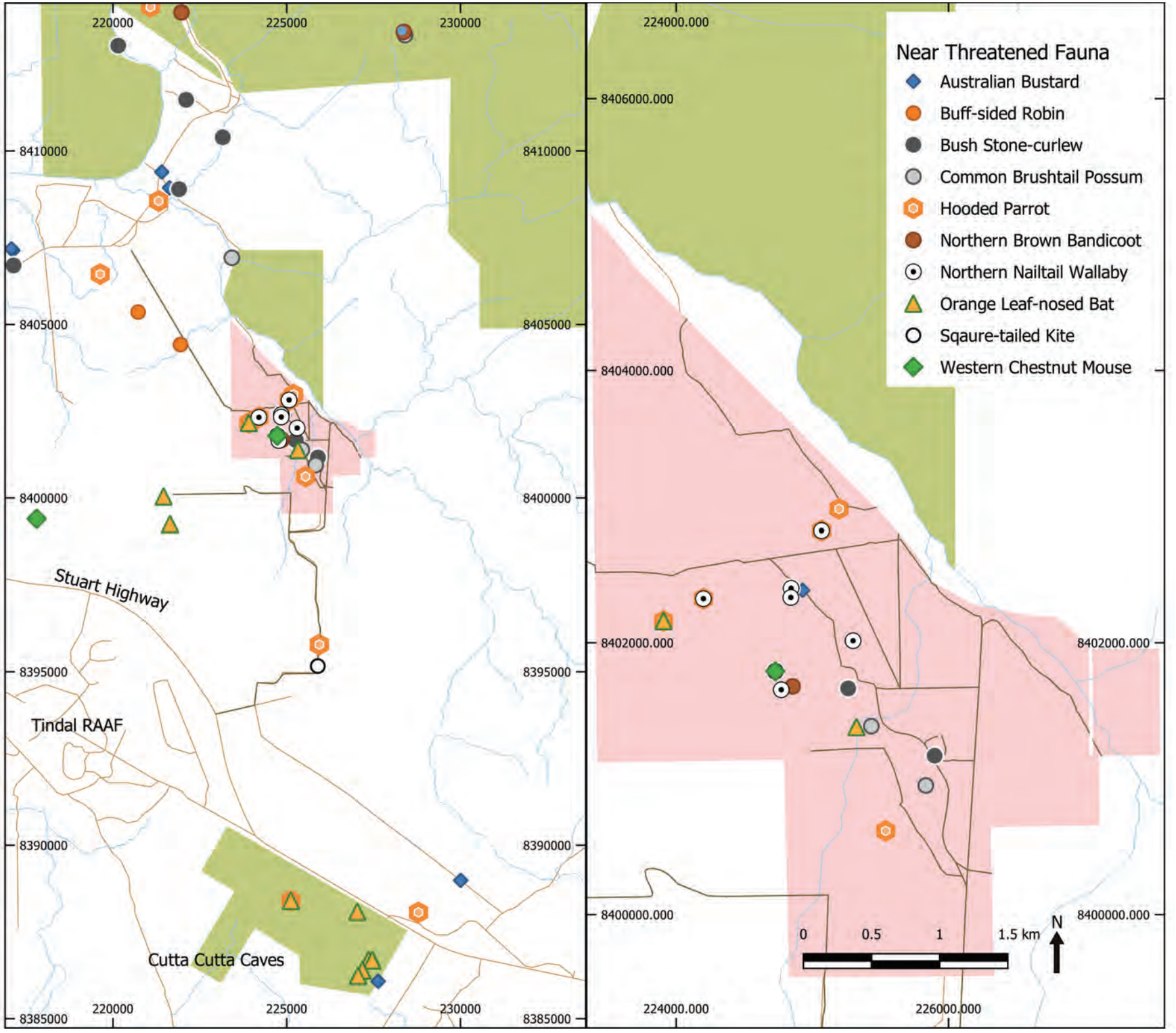


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Table 14 Northern Territory *TPWC Act 1976* Near Threatened Fauna Species

Common Name	Scientific Name	Status	Habitat Association	Last Recorded	Maud Creek ML	Source	Record Location/s	Habitat Associations	Local Status
Australian Bustard	*Ardeotis australis*	Near Threatened	Open woodland, grassland	2019	X	Current study	Recorded in open grassland north of the pit	Primarily occur in tussock grasslands, low shrublands and lightly timbered open woodlands (Marchant & Higgins 1993).	Last record 2019
Bush Stone-curlew	*Burhinus grallarius*	Near Threatened	Open woodland, grassland	2019	X	Current study	Recorded at several locations in the study area, 2018-2019	Habitat includes lightly timbered open woodlands and forest (Marchant & Higgins 1993).	Last record 2019
Square-tailed Kite	*Lophoictinia isura*	Near Threatened	Open forests and woodland	2019	X	Current study	Observed in open forest on the access road (2019)	Forage over open savanna woodland and forest, and are specialized to capture prey from canopy foliage (Marchant & Higgins 1993). Nest in forest or woodland usually within 100 m of water (Marchant & Higgins 1993).	Last record 2019
Hooded Parrot	*Psephotus dissimilis*	Near Threatened	Open forest and woodland	2019	X	Current study	Observed on in open forest on the access road (2019)	Forest and woodland habitats	Last record 2019
Northern Brown Bandicoot	*Isoodon macrourus*	Near Threatened	Open woodland	2019	X	Current study	Camera trap record from one location (G3) in *Eucalyptus pruinosa* open woodland	Forest, woodland and grassland habitats	Camera trap 2019
Northern Brushtail Possum	*Trichosurus vulpecula arnhemensis*	Near Threatened	Open woodland	2019	X	Current study	Camera trap record from two locations (G1, G2) in open woodland	Forest and woodland habitats	Camera trap 2019
Northern Nailtail Wallaby	*Onychogalea unguifera*	Near Threatened	Open woodland, grassland	2019	X	Current study	Camera trap record from three locations (G3, G4, G5) in grassland and open woodland	Open forest and woodland	Camera trap 2019
Orange Diamond-faced Bat	*Rhinonicteris aurantia*	Near Threatened	Forest and woodland	2007	X	EMS 2007b	Trapped at limestone caves west of the study area, calls detected on Gold Creek (EMS 2007a)	Roost in warm humid caves and forage in a range of habitats (Churchill *et al.* 2013).	Last recorded in 2007
Arnhem Sheath-tail Bat	*Taphozous kapalgensis*	Near Threatened	Forest and Woodland	2007	X	EMS 2007b	Echolocation calls detected on Gold Creek	Open forest, savannah woodland, sandstone escarpments	Last recorded in 2007
Western Chestnut Mouse	*Pseudomys nanus*	Near Threatened	Open woodland, grassland	2007	X	EMS 2007b	Pitfall trap capture in grassland (EMS 2007b)	Habitats supporting dense tussock grasses, savanna woodland and grasslands on lateritic or sandy soils (Robinson & Cooper 2013).	Last recorded in 2007.

6.0 TERRESTRIAL ECOLOGY – IMPACTS

In contrast to several previous proposals to undertake open cut mining and processing on site, KL Gold intends to construct an underground mine and process the ore offsite near Pine Creek. Road trains will haul ore from the project to the Union Reefs facility for processing. Impacts on terrestrial and aquatic ecology within the Maud Creek/Katherine River catchment will be substantially reduced by processing ore at Union Reefs. Local drainage lines and water courses will not require diversion and the risk of chemical and oxidative pollution will be minimised with no processing on site.

Detail regarding project scope, size and duration, infrastructure, production, output and decommissioning was available to the consultants at the time this review was written to fully assess impacts on terrestrial ecology. Detailed consideration of impacts will be possible on issue of PER or EIS Terms of Reference, containing specific guidelines for assessment provided by the NT Environment Protection Agency. Given that the 2006 Terra Gold mining proposal was considered by the NT EPA as a project of higher complexity to be assessed within an EIS framework, it is possible that any future assessment of the Maud Creek project with follow a similar assessment path.

Based on current understanding of the project, it is anticipated that the following factors may impact on terrestrial ecology and biodiversity both within Maud Creek station, in adjacent habitats and downstream of the project.

The following project related factors were assessed in relation to their potential to impact biodiversity values and threatened/significant species:

- Habitat clearance;
- Habitat fragmentation;
- Dewatering of shaft;
- Contaminated run-off and ground water;
- Draw-down of water tables;
- Erosion and sedimentation;
- Weeds and pests;
- Altered fire regimes;

- Collisions with vehicles (wildlife);
- Light and noise; and
- Dust.

Ecological surveys and a review of existing data indicate that several significant fauna species (*EPBC Act 1999* and *TPWC Act 2000* listed threatened and near threatened) occur within the study area, requiring specific management and monitoring measures. Significant species within the Maud Creek lease or adjacent areas include:

- Endangered (EPBC Act) species (Gouldian finch);
- Vulnerable (EPBC Act) species (red goshawk, ghost bat);
- Vulnerable (TPWC Act) species (Mertens' water monitor);
- Near threatened (TPWC Act) species (Australian bustard, bush stone-curlew, hooded parrot, square-tailed kite, northern brown bandicoot, northern brushtail possum, orange diamond-faced bat, Arnhem sheath-tailed bat, northern nailtail wallaby and western chestnut mouse);
- Potential presence of near threatened (TPWC Act) flora species (*Tephrosia humifusa*);
- Potential presence of data deficient (TPWC Act) flora species (*Phyllanthus lacerosus*).

6.1.1 Vegetation/Habitat Clearing

Loss of habitat is a key threatening process under the EPBC Act. Vegetation clearing reduces the size, conservation value, and connectivity of habitat for flora and fauna species, potentially impacting biodiversity. These impacts are immediate and significant in the short-term. Impacts may persist in the long-term if habitat created during mine rehabilitation does not closely resemble pre-mining ecosystems. In addition, if sufficient habitat refuges are not maintained locally prior to the maturation of rehabilitated land, local extinction of flora and fauna may occur.

Some of the impacts of habitat clearance are likely to persist in the long-term.

Important habitats will require consideration once a project footprint has been determined. Key issues include:

- Loss of foraging habitat for MNES species (gouldian finch, red goshawk, ghost bat) and Northern Territory listed significant species (near threatened) that occur in savanna woodland;

- Loss of an area of riparian forest for the mining project, habitat for a number of listed threatened and significant species (near threatened) fauna species.

Management/Mitigation

- Protection and enhancement of areas supporting important gouldian finch feeding grasses;
- Limits on disturbance of riparian zones.
- Avoidance of key habitat types (e.g. limestone areas) during placement of infrastructure, including access roads.
- Investigate commitments to improve habitat quality in balance areas surrounding mine operations, including ecological fire management, control of feral species (cattle, water buffalo, cats, feral pigs and donkey) and weed control and management.

6.1.2 Habitat Fragmentation

The risk of habitat fragmentation as a result of mining in the central Maud Creek is low. The proposed project footprint exists within a largely intact matrix of remnant vegetation, allowing connectivity between remnant habitats. Important habitats were considered during the planning phase of the project, with the project footprint designed to minimise clearing. There is a potential for clearing for the access road corridor to cause fragmentation and connectivity issues in habitats to the west of the lease area, particularly where a proposed route intersects karst (limestone) habitats.

Management/Mitigation

- Assess potential haul road/access routes to the west of the lease area if a new access route is required.
- Consider placement of infrastructure in a manner that minimises habitat fragmentation, particularly at key locations (e.g. riparian corridors, karst areas).

6.1.3 Contaminated Run-off

Materials exposed at the surface during mining operations can lead to contamination of local waterways via surface run-off following heavy rain. This is primarily a risk during the operational phase of the project if not appropriately managed.

Management/Mitigation

- Careful characterisation of material and design of run-off dams to capture contaminated surface waters are required to prevent excessive amounts of contaminants from entering local waterways.

6.1.4 Draw-down of water tables

Mining below the water table requires de-watering to prevent flooding of the mining operations. Removal of this water from an open cut ultimately lowers the level of the water table, which can affect surface water levels where they are fed by groundwater. These changes in water levels could potentially cause a loss of surface pools and remove potential drinking sites for terrestrial fauna. If water table changes impact riparian vegetation, there could also be a loss of habitat or connectivity of habitat for fauna.

Management/Mitigation

- If monitoring reveals that draw-down threatens the persistence of pools used by gouldian finches, remedial action (enlargement of pools or supplementary watering) should be considered.

6.1.5 Erosion and Sedimentation

A lack of vegetation on exposed surfaces such as dam walls, roads, levees and borrow areas prior to these being rehabilitated could increase the amount of sediment washing into local waterways following heavy rain. Sedimentation of waterways may decrease the size or connectivity of dry season pools, reduce available drinking water for MNES such as gouldian finches and impact habitat for migratory birds.

Management/Mitigation

- Provide mitigation measures such as sediment traps, run-off dams and bund walls.

6.1.6 Weeds and Pests

A total of 22 species of weeds (non-native plants) have been recorded within the Maud Creek study area. Establishment of weeds can impact biodiversity, alter ecological systems and change fire regimes. Weeds can also prevent successful re-establishment of native vegetation and grasses at rehabilitated sites.

Seven feral animals have been recorded on the Maud Creek lease. Several pose a hazard to the success of rehabilitation efforts and can damage local waterways. Feral cats have been recorded on the Maud Creek lease and have been implicated in declines in riparian birds, in combination with other factors, such as heavy grazing or riparian vegetation and removal of dingoes. Cane toads have been implicated in the decline of a range of species since their arrival in the region.

Management/Mitigation

- Manage the spread of weeds during site operations.
- Infestations of declared weeds should be controlled as they are detected.
- Initiate additional controls (e.g. wash down of equipment entering site) if potential weed introductions or movements are identified.
- Consider removal/control of cattle, feral herbivores and feral pigs in core management/mining areas.
- Investigate feral cat control methods.

6.1.7 Altered Fire Regimes

Fire regimes can have significant impacts on biodiversity and represent a recognised threatening process for a range of threatened fauna species occurring in savanna woodland, limestone and sandstone escarpment habitats. Inappropriate fire regimes are a likely contributor to the local extinction and decline of several threatened species that occur or formerly occurred in local and regional habitats. The project is not expected to cause substantial changes to local fire regimes.

Management/Mitigation

- Develop a fire management to include provision of an ecologically beneficial fire regime, enabling improved management of biodiversity and threatened savannah woodland species.
- Revise the fire management plan in order to appropriately manage feeding and nesting resources of the gouldian finch.
- Actively reduce the frequency, extent and/or intensity of late dry season fires.

6.1.8 Collisions with Vehicles (Wildlife)

Increased or expanded mine traffic may increase risk of vehicle/wildlife collisions. Significant species at risk from road-kill include the Australian bustard, orange leaf-nosed bat, spectacled hare-wallaby, northern nailtail wallaby and gouldian finch. Macropods may be particularly vulnerable to collisions with vehicles, and increased traffic through important habitat may elevate the risk of this hazard.

Management/Mitigation

- Undertake remedial action if high levels of vehicle/wildlife collision or impacts of collisions are detected for significant fauna species, including physical controls (e.g. fencing, barriers), warning signs, speed limits and controls at high risk locations or habitats.

- Install warning signs and modify driver education to highlight vehicle/wildlife collision issues (induction).

6.1.9 Light and Noise

Light and noise can in impact wildlife in variety of ways, depending on the frequency, duration and intensity. The ecological impacts of light and noise are typically restricted to the close proximity (<100 m) of operational areas. The risk posed to wildlife from lighting and noise for the current project is not considered to be significant, however this will require reassessment once infrastructure plans are developed.

6.1.10 Dust

Mining activity, processing, earthworks and vehicular traffic can generate substantial amounts of dust during dry weather. Dust can impact vegetation through physical smothering, and can also affect flora and fauna when it contains high concentrations of metals. Increased levels of metals in water sources or on food sources as a result of dust plumes can potentially impact fauna. Underground mining operations are likely to have reduced risk of dust production.

Management/Mitigation

- Develop a dust management plan and monitoring program, including ongoing dust monitoring and contingency for increased management if impacts are detected.

Ecological Management Services/EcoScience NT

February 2020

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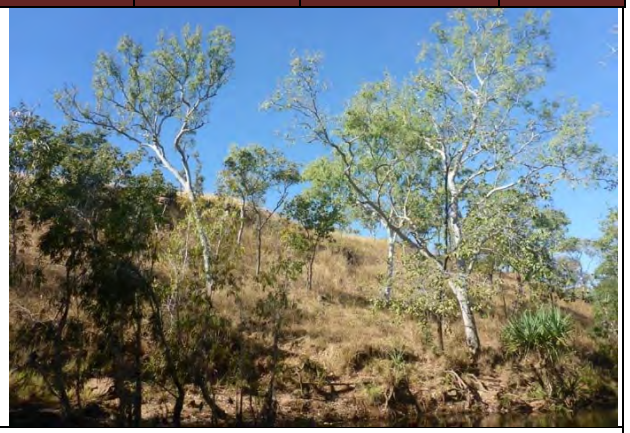
APPENDIX 1 FLORA OF THE MAUD CREEK STUDY AREA

APPENDIX 1.1 VEGETATION MAPPING UNITS OCCURRING WITHIN THE MAUD CREEK STUDY AREA

HILLS AND RISES		
2	***Eucalyptus and Corymbia* dominated low open woodland on hills and low rises**	
VMU 2a	***Eucalyptus tectifica, Erythrophleum chlorostachys* and *E. dichromophloia* low open woodland on rocky side slopes**	
LANDFORM:	Rugged terrain on side slopes, with slopes 15-40%	
SOILS:	Very shallow or skeletal soils with rock outcrop (Rudosols)	
VEGETATION:	*Eucalyptus tectifica, Erythrophleum chlorostachys* and *E. dichromophloia* low open woodland over tussock grass (occasional annual grass)	
Common species present	*Eucalyptus tectifica* *Erythrophleum chlorostachys* *Eucalyptus dichromophloia* *Corymbia foelscheana*	

2	***Eucalyptus and Corymbia* dominated low open woodland on hills and low rises**			
VMU 2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid open woodland and woodland on rocky rises			
LANDFORM:	Rocky hills and rugged terrain on side slopes with slopes 5 – 15%			
SOILS:	Soils generally shallow or skeletal with areas of red earths on rocky rises (Rudosols)			
VEGETATION:	Low woodland to mid open woodland. *Eucalyptus distans, Erythrophleum chlorostachys* and *Corymbia foelscheana* low open woodland over *Brachychiton megaphyllus, Grewia retusifolia and Ampelocissus frutescens* low woodland over *Sorghum plumosum, Themeda triandra* and *Heteropogon contortus* mid open tussock grassland			
Common species present	*Eucalyptus distans* *Erythrophleum chlorostachys* *Corymbia foelscheana* *Corymbia dichromophloia*		Sites	MC18, ES19, ES20
Canopy average height: 6 m	Upper stratum	Mid and lower stratum		Ground stratum
Other species present	*Brachychiton megaphyllus* *Grevillea mimosoides* *Brachychiton diversifolius* *Cochlospermum fraseri* *Buchanania obovata* *Hakea arborescens* *Persoonia falcata* *Brachychiton megaphyllus* *Clerodendrum floribundum* *Ampelocissus frutescens*	*Flueggea virosa subsp. melanthesoides* *Hibiscus meraukensis* *Evolvulus alsinoides* *Heliotropium ventricosum* *Ampelocissus frutescens* *Grewia retusifolia* *Mitrasacme nudicaulis var. nudicaulis* *Sorghum plumosum* *Themeda triandra* *Mnesithea formosa* Heteropogon contortus Chrysopogon fallax		*Hibiscus meraukensis* *Uraria lagopodioides* *Ipomoea eriocarpa* *Uraria lagopodioides* *Ipomoea eriocarpa* *Schizachyrium fragile* *Spermacoce sp.* *Polygala integra* *Polygala barbata* *Phyllanthus exilis*

2	***Eucalyptus and Corymbia* dominated low open woodland on hills and low rises**			
VMU 2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills			
LANDFORM:	Low hills, gently undulating terrain with slopes up to 5%			
SOILS:	Soils either very shallow and gravelly, or sandy (Tenosols)			
VEGETATION:	Low woodland to open woodland. *Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland over *Themeda triandra* and *Sorghum plumosum* tussock grass			
Common species present	*Eucalyptus tectifica* *Corymbia foelscheana* *Erythrophleum chlorostachys* *Eucalyptus dichromophloia*		Sites	GT10, ES3, ES4
	Upper stratum	Mid and lower stratum		
Other species present	*Flueggea virosa subsp. melanthesoides* *Brachychiton diversifolius* *Uraria lagopodioides* *Cochlospermum fraseri* *Buchanania obovata*	*Sorghum plumosum* *Themeda triandra* *Mnesithea formosa* *Heteropogon contortus* *Chrysopogon fallax*		

ALLUVIAL PLAINS					
3	**Mixed species Low Open Woodland to Mid-high Woodland on Alluvial Plains**				
VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain				
LANDFORM:	Undulating terrain on alluvial plains				
SOILS:	Sandy loams and red earth (Vertisols)				
VEGETATION:	Low open woodland, low woodland to mid-high woodland Mixed species low woodland over mid *Hakea arborescens, Carissa spinarium, Acacia holosericea* over *Themeda triandra* and *Heteropogon contortus* tussock grassland				
Common species present	*Eucalyptus tectifica* *Erythrophleum chlorostachys* *Corymbia dichromophloia* *Corymbia foelscheana* *Terminalia platyphylla* *Hakea arborescens*	Sites	MC2, MC7, MC11, MC17, GT4, GT5, GT12, GT13, ES33, ES34, ES37		
Canopy average height: 7.5 m	Upper stratum	Mid & lower stratum		Ground stratum	
Other species present	*Antidesma ghesaembilla* *Corymbia foelscheana* *Hakea arborescens* *Eucalyptus tectifica* *Vitex trifoliata* *Vachellia pallidifolia* *Grewia retusifolia* *Atalaya hemiglauca* *Brachychiton diversifolius* *Terminalia pterocarya*	*Carissa spinarium* *Hakea arborescens* *Ficus aculeata* *Acacia holosericea* *Polymeria ambigua* *Euphorbia schizolepis* *Flueggea virosa* *Brachychiton megaphyllus* *Buchanania obovata* *Cochlospermum fraseri* *Erythrophleum chlorostachys*	*Neptunia gracilis f. gracilis* *Senna obtusifolia* *Desmodium muelleri* *Trichodesma zeylanica* *Phyllanthus lacerosus* *Rhynchosia minima* *Flueggea virosa subsp. melanthesoides* *Brachyachne convergens* *Heteropogon contortus* *Acacia umbellata*	*Rhynchosia minima* *Alysicarpus ovalifolius* *Cucumis melo* *Ipomoea argillicola* *Hibiscus multilobatus* *Goodenia leiosperma* *Alysicarpus schomburgkii* *Tephrosia humifusa* *Mesosphaerum suaveolens* *Gossypium australe* *Sida acuta*	

		Terminalia pterocarya *Vachellii pallidifolia* *Corymbia foelscheana* *Eucalyptus tectifica* *Persoonia falcata* *Clerodendrum floribundum* *Ampelocissus frutescens* *Petalostigma pubescens* *Desmodium flagellare* *Spermacoce pogostoma* *Phyllanthus maderaspatanus* *Apowollastonia cylindrica* *Cayratia trifolia* *Waltheria indica* *Calytrix exstipulata*	*Chrysopogon oliganthus* *Merremia quinata* *Cucumis melo subsp. melo* *Fimbristylis spp* *Euphorbia schizolepis* *Leptopus decaisnei* *Alysicarpus schomburgkii* *Cajanus marmoratus* *Crotalaria brevis* *Oldenlandia mitrasacmoides* *Spermacoce tectanthera* *Thecanthes concreta* *Hybanthus enneaspermus* *Flemingia parviflora*	*Alloteropsis semialata* *Sida spinosa* *Heteropogon contortus* *Themeda triandra* *Tinospora smilacina* *Sarga intrans* *Polygala integra* *Spermacoce dolichosperma* *Crotalaria medicaginea* *Alloteropsis semialata* *Heteropogon contortus* *Sehima nervosum* *Themeda triandra* *Goodenia leiosperma* *Goodenia sp. Melville Island*

3	Mixed species Low Open Woodland to Mid-high Woodland on Alluvial Plains				
VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid- high woodland on depositional plains				
LANDFORM:	Undulating terrain on alluvial plains				
SOILS:	Red, yellow and brown earths (Vertisols)				
VEGETATION:	Low open woodland. *Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris low open woodland* over *Sehima nervosum* and *Themeda triandra* tussock grassland				
Common species present	*Corymbia foelscheana* *Corymbia latifolia* *Cochlospermum fraseri* *Eucalyptus tectifica* *Pandanus spiralis*		Sites	MC1, MC6, MC14, MC19, ES35, ES36	
Canopy average Height: 9 m	Upper stratum	Mid & lower stratum		Ground stratum	
Other species present	*Ficus aculeata* *Planchonia careya* *Vachellia pallidifolia* *Cochlospermum fraseri* *Eucalyptus tectifica* *Flueggea virosa subsp. melanthesoides* *Brachychiton diversifolius subsp. diversifolius* *Cochlospermum fraseri* *Brachychiton megaphyllus* *Acacia holosericea* *Corymbia foelscheana* *Corymbia ferruginea*	*Terminalia canescens* *Cajanus marmoratus* *Crotalaria montana* *Crotalaria novae-hollandiae* *Cullen badocanum* *Indigofera linifolia* *Rhynchosia minima* *Tephrosia filipes* *Tephrosia humifusa* *Zornia muriculata subsp. angustata* *Goodenia leiosperma* *Senna obtusifolia* *Brachyachne convergens* *Ampelocissus acetose* *Alysicarpus muelleri*		*Alloteropsis semialata* *Bothriochloa pertusa* *Eragrostis schultzii* *Sehima nervosum* *Themeda triandra* *Anisomeles malabarica* *Mesoshpaerum suaveolens* *Sida acuta* *Mnesithea formosa* *Spermacoce tectanthera* *Ampelocissus frutescens* *Cayratia trifolia* *Euphorbia schizolepis* *Phyllanthus maderaspatensis var. angustifolius* *Alysicarpus ovalifolius*	

3	Mixed species Low Open Woodland to Mid-high Woodland on Alluvial Plains			
VMU 3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains			
LANDFORM:	Flat to undulating plains on cracking clays and red soils on extensive alluvial plains			
SOILS:	Lithosols with cracking clays on lower slopes and drainage floors (Vertisols)			
VEGETATION:	Low open woodland to woodland. Variable species dominance including *Corymbia foelscheana, E. tectifica, Corymbia latifolia* and *C. grandifolia* low open woodland to *Terminalia pterocarya* and *Hakea arborescens* woodland over *Aristida sp.* and *Heteropogon contortus* grassland			
Common species present	*Eucalyptus tectifica* *Corymbia foelscheana* *Corymbia confertiflora* *Corymbia latifolia* *Corymbia grandifolia* *Terminalia pterocarya* *Hakea arborescens*	Sites	MC2, MC3, MC10, MC12, MC13, GT1, GT2, GT3, GT9, GT10, GT11, GT24, ES7, ES11, ES14, ES16, ES18, ES27, ES28, ES29, ES30, ES31, ES32	
Canopy average height: 9 m	Upper stratum	Mid & lower stratum	Ground stratum	
Other species present	*Erythrophleum chlorostachys* *Acacia holosericea* *Corymbia ferruginea* *Brachychiton megaphyllus* *Erythrina variegata var. orientalis* *Hakea arborescens* *Cochlospermum fraseri* *Terminalia pterocarya* *Brachychiton diversifolius* *Terminalia platyphylla*	*Carissa spinarium* *Ficus aculeata* *Acacia umbellata* *Petalostigma quadriloculare* *Flueggea virosa* *Grewia retusifolia* *Indigofera linifolia* *Mesosphaerum suaveolens* *Abutilon sp.* *Hibiscus panduriformis* *Sida spinosa*	*Heteropogon contortus* *Aristida sp.* *Mesosphaerum suaveolens* *Brachyachne convergens* *Iseilema macratherum* *Themeda triandra* *Trichodesma zeylanicum* *Senna obtusifolia* *Cucumis melo subsp. melo* *Euphorbia schizolepis* *Petalostigma banksii*	

	Owenia vernicosa *Bauhinia cunninghamii* *Gardenia megasperma*	*Alloteropsis semialata* *Brachyachne convergens* *Dichanthium fecundum* *Mnesithea formosa* *Themeda triandra* *Oldenlandia mitrasacmoides* *Helicteres sp.* *Waltheria indica* *Grewia retusifolia*	*Phyllanthus maderaspatensis var. angustifolius* *Alysicarpus muelleri* *Desmodium flagellare* *Indigofera linifolia* *Stylosanthes hamata* *Tephrosia humifusa* *Hibiscus multilobatus* *Flemingia pauciflora*

3	Mixed species Low Open Woodland to Mid-high Woodland on Alluvial Plains			
VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains			
LANDFORM:	Flat to undulating on alluvial plains			
SOILS:	Lithosols with cracking clays on lower slopes and drainage floors (Vertisols)			
VEGETATION:	Low open woodland to low woodland *Eucalyptus pruinosa* and *Corymbia confertiflora* low open woodland over *Heteropogon contortus, Bothriochloa pertusa* and *Brachyachne convergens* tussock grassland			
Common species present	*Eucalyptus pruinosa* *Corymbia confertiflora* *Eucalyptus pruinosa* *Hakea arborescens*		Sites	MC3, MC20, GT7, GT26, ES10, ES25, ES26
Canopy average height: 5 m	Upper stratum	Mid & lower stratum		Ground stratum
Other species present	*Erythrophleum chlorostachys* *Hakea arborescens* *Acacia holosericea*	*Eucalyptus pruinosa* *Brachychiton megaphyllus* *Ampelocissus frutescens* *Grevillea mimosoides* *Carissa spinarium* *Mesosphaerum suaveolens* *Heteropogon contortus* *Polymeria ambigua* *Heliotropium sp.* *Aristida sp.* *Phyllanthus sp.* *Sida spinosa*		*Senna obtusifolia* *Polymeria ambigua* *Rhynchosia minima* *Crotalaria medicaginea* *Uraria lagopodioides* *Tephrosia filipes* *Evolvulus alsinoides* *Brachyachne convergens* *Grewia retusifolia* *Spermacoce sp.* *Alysicarpus schomburgkii*

DRAINAGE FEATURES				
4	**Mixed Species Tall Woodland, Mid-high woodland to Low Open Woodland on Drainage Lines**			
VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines			
LANDFORM:	Riparian corridor with incised channel and braided channels with sandy levees on major creeks and tributaries			
SOILS:	Deep sandy to gravelly soils, sometimes poorly drained often severely gullied (Tenosols, Hydrosols)			
VEGETATION:	Woodland to open forest. *Corymbia bella, Melaleuca leucadendra, Melaleuca argentea* and *Terminalia platyphylla* mid woodland over *Heteropogon contortus, Bothriochloa pertusa* and *Mesosphaerum suaveolens* mid tussock grassland			
Common species present	*Corymbia bella* *Eucalyptus alba* var. *australasica* *Melaleuca leucadendra* *Melaleuca argentea* *Terminalia platyphylla* *Brachychiton diversifolius* *Lophostemon grandiflorus*		Sites:	MC8, GT27, GT28, GT29, ES2, ES19, ES20, ES21, ES38
Canopy average height: 9.5 m	Upper stratum	Mid & lower stratum		Ground stratum
Other species present	*Eucalyptus patellaris* *Pandanus aquaticus* *Eucalyptus camaldulensis* *Eucalyptus var. australasica* *Timonius timon* *Buchanania obovata*	*Flueggea virosa subsp. melanthesoides* *Acacia holosericea* *Lophostemon lactifluus* *Pavetta brownii var. brownii* *Grewia retusifolia*		*Heteropogon contortus* *Senna obtusifolia* *Mesosphaerum suaveolens* *Stylosanthes hamata* *Vigna vexillata* *Sida acuta*

	Syzygium eucalyptoides *Terminalia platyphylla*	*Triumfetta rhomboidea* *Clerodendrum floribundum* *Nelsonia campestris* *Desmodium filiforme* *Sida rhombifolia* *Brachyachne convergens*	*Jasminum molle* *Sesamum indicum* *Bothriochloa pertusa* *Chrysopogon oliganthus*

4	Mixed Species Tall Woodland to Low Open Woodland on Drainage Lines			
VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks			
LANDFORM:	Riparian woodland on poorly drained alluvial soils fringing minor drainage lines			
SOILS:	Deep sandy to gravelly soils, sometimes poorly drained often severely gullied (Tenosols, Hydrosols)			
VEGETATION:	Low open woodland to tall woodland. *Lophostemon grandiflorus*, *Corymbia grandifolia* and *E. tectifica* mid-high tall woodland over mid *Heteropogon contortus* and *Mesosphaerum suaveolens*			
Common species present	*Lophostemon grandifloras,* *Eucalyptus tectifica* *Corymbia grandifolia* *Timonius timon* *Terminalia platyphylla*		Sites:	MC4, MC5, GT6, ES12, ES15,
Canopy average height: 10 m	Upper stratum	Mid & lower stratum		Ground stratum
Other species present	*Corymbia foelscheana* *Hakea arborescens* *Lophostemon grandiflorus* *Eucalyptus patellaris* *Brachychiton diversifolius* *Eucalyptus alba* var *australasica* *Cochlospermum fraseri* *Buchanania obovata* *Diospyros humilius*	*Brachychiton megaphyllus* *Lophostemon grandiflorus* *Hakea arborescens* *Mesosphaerum suaveolens* *Stylosanthes hamata* *Tephrosia humifusa* *Vigna radiata* *Vigna radiata var. sublobata* *Anisomeles malabarica* *Sida spinosa* *Vachellii pallidifolia* *Passiflora foetida* *Sesamum indicum*		*Calotropis procera* *Bidens bipinnata* *Trichodesma zeylanicum* *Senna obtusifolia* *Polymeria ambigua* *Euphorbia vachellii* *Leptopus decaisnei* *Alysicarpus muelleri* *Calopogonium mucunoides* *Crotalaria medicaginea* *Flemingia parviflora* *Macroptilium atropurpureum* *Rhynchosia minima*

		Bothriochloa bladhii *Bothriochloa pertusa* *Brachyachne convergens* *Cenchrus sp.* *Heteropogon contortus*	*Sesbania cannabina* *Stylosanthes hamata* *Vigna radiata* *Sida acuta* *Echinochloa colona* *Setaria apiculata*

4	Mixed Species Tall Woodland, Mid-high woodland to Low Open Woodland on Drainage Lines			
VMU 4c	*Terminalia platyphylla* low open woodland to grassland			
LANDFORM:	Broad drainage flats or seasonally waterlogged areas with very slight slopes			
SOILS:	Rarely channelled poorly drained soils and cracking clays (Kandosols, Hydrosols)			
VEGETATION:	*Terminalia platyphylla* low open woodland to isolated low trees with *Brachyachne convergens, Themeda triandra* grassland on cracking clay alluvial back plains			
Common species present	*Terminalia platyphylla* *Hakea arborescens* *Carissa spinarium*		Sites:	MC9, ES8, ES25
Canopy average height: 8 m	Upper stratum	Mid & lower stratum		Ground stratum
Other species present	*Terminalia platyphylla*	*Hakea arborescens* *Carissa spinarium* *Oldenlandia mitrasacmoides* *Spermacoce pogostoma* *Stemodia viscosa* *Ampelocissus acetosa* *Ampelocissus frutescens* *Indigofera linifolia* *Tephrosia filipes* *Hyptis suaveolens* *Sida spinosa* *Sehima nervosum* *Themeda triandra*		*Senna obtusifolia* *Polymeria ambigua* *Euphorbia schizolepis* *Flueggea virosa subsp. melanthesoides* *Phyllanthus maderaspatensis var. angustifolius* *Alysicarpus muelleri* *Alysicarpus ovalifolius* *Desmodium flagellare* *Brachyachne convergens* *Chionachne hubbardiana* *Echinochloa colona*

APPENDIX 1.2 FLORA SPECIES LIST

List of species recorded during all surveys conducted within the Maud Creek study area

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
ACANTHACEAE	*Nelsonia campestris*						x		
ANACARDIACEAE	*Buchanania obovata*						x	x	x
APOCYNACEAE	*Carissa lanceolata*						x		
APOCYNACEAE	*Carissa spinarium*							x	x
APOCYNACEAE	*Gymnanthera oblonga*								x
APOCYNACEAE	*Marsdenia viridiflora*								x
ASCLEPIADACEAE	*Calotropis procera*	Introduced					x		
ASCLEPIADACEAE	*Marsdenia viridiflora subsp. tropica*						x		
ASTERACEAE	*Apowollastonia cylindrica*	Not Evaluated				x		x	x
ASTERACEAE	*Bidens bipinnata*	Uncertain					x		x
ASTERACEAE	*Bidens pilosa*	Introduced						x	
ASTERACEAE	*Pentalepis*					x			
ASTERACEAE	*Pterocaulon serrulatum*						x		
ASTERACEAE	*Pterocaulon sphacelatum*								x
ASTERACEAE	*Tridax procumbens*	Introduced					x		
BIGNONIACEAE	*Dolichandrone heterophylla*							x	
BIGNONIACEAE	*Dolichandrone filiformis*								x
BIXACEAE	*Cochlospermum fraseri*						x	x	x
BIXACEAE	*Cochlospermum fraseri subsp. fraseri*								x
BIXACEAE	*Cochlospermum fraseri subsp. heteronemum*								x
BORAGINACEAE	*Heliotropium plumosum*					x			x
BORAGINACEAE	*Heliotropium spp.*	Not Evaluated					x		

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
BORAGINACEAE	*Heliotropium ventricosum*							x	x
BORAGINACEAE	*Trichodesma zeylanica*						x	x	
BURSERACEAE	*Canarium australianum*						x		x
CAESALPINIACEAE	*Erythrophleum chlorostachys*					x	x	x	x
CARYOPHYLLACEAE	*Polycarpaea breviflora*						x		
COMBRETACEAE	*Terminalia canescens*						x	x	x
COMBRETACEAE	*Terminalia carpentariae*							x	x
COMBRETACEAE	*Terminalia ferdinandiana*							x	x
COMBRETACEAE	*Terminalia platyphylla*								x
COMBRETACEAE	*Terminalia platyptera*								x
COMBRETACEAE	*Terminalia pterocarya*			YES			x	x	x
COMBRETACEAE	*Terminalia volucris*								x
COMMELINACEAE	*Commelina ensifolia*						x		
CONVOLVULACEAE	*Bonamia media*								x
CONVOLVULACEAE	*Bonamia pannosa*							x	
CONVOLVULACEAE	*Evolvulus alsinoides*							x	x
CONVOLVULACEAE	*Ipomoea argillicola*							x	x
CONVOLVULACEAE	*Ipomoea eriocarpa*						x	x	x
CONVOLVULACEAE	*Ipomoea polymorpha*						x		
CONVOLVULACEAE	*Ipomoea triloba*	Introduced					x		
CONVOLVULACEAE	*Merremia quinata*						x		
CONVOLVULACEAE	*Polymeria ambigua*					x	x	x	x
CONVOLVULACEAE	*Xenostegia tridentata*						x		
CUCURBITACEAE	*Cucumis sp.*					x			
CUCURBITACEAE	*Cucumis melo*	Infraspecific				x		x	x
CUCURBITACEAE	*Cucumis melo subsp. melo*						x		
CUCURBITACEAE	*Trichosanthes pilosa*					x			

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
CUCURBITACEAE	*Trichosanthes sp.*					x			
CYPERACEAE	*Cyperus pulchellus*					x			
CYPERACEAE	*Fimbristylis spp*						x		
CYPERACEAE	*Rhynchospora exserta*						x		
CYPERACEAE	*Scleria brownii*								x
EBENACEAE	*Diospyros humilis*						x		
ERYTHROXYLACEAE	*Erythroxylum ellipticum*								x
EUPHORBIACEAE	*Croton arnhemicus*								x
EUPHORBIACEAE	*Euphorbia bifida*					x		x	x
EUPHORBIACEAE	*Euphorbia coghlanii*					x		x	x
EUPHORBIACEAE	*Euphorbia schizolepis*						x	x	x
EUPHORBIACEAE	*Euphorbia schultzii*						x		x
EUPHORBIACEAE	*Euphorbia vachellii*						x		
EUPHORBIACEAE	*Flueggea virosa subsp. melanthesoides*						x	x	
EUPHORBIACEAE	*Leptopus decaisnei*						x		
EUPHORBIACEAE	*Mallotus nesophilus*								x
EUPHORBIACEAE	*Petalostigma banksii*						x		
EUPHORBIACEAE	*Petalostigma pubescens*						x	x	
EUPHORBIACEAE	*Phyllanthus maderaspatensis var. angustifolius*						x		
EUPHORBIACEAE	*Sauropus stenocladus*						x		
FABACEAE	*Acacia gonocarpa*								x
FABACEAE	*Acacia holosericea*							x	x
FABACEAE	*Acacia umbellata*								x
FABACEAE	*Aeschynomene sp.*					x			
FABACEAE	*Alysicarpus brownii*	Data Deficient		YES	Yes				x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
FABACEAE	*Alysicarpus muelleri*					x	x		x
FABACEAE	*Alysicarpus ovalifolius*	Introduced					x	x	
FABACEAE	*Alysicarpus schomburgkii*					x	x	x	x
FABACEAE	*Bauhinia cunninghamii*								x
FABACEAE	*Bauhinia malabarica*								x
FABACEAE	*Cajanus geminatus*								x
FABACEAE	*Cajanus marmoratus*					x	x	x	x
FABACEAE	*Calopogonium mucunoides*	Introduced					x		
FABACEAE	*Cathormion umbellatum*								x
FABACEAE	*Chamaecrista absus var. absus*								x
FABACEAE	*Christia australasica*						x		
FABACEAE	*Crotalaria brevis*						x		
FABACEAE	*Crotalaria goreensis*	Introduced					x	x	
FABACEAE	*Crotalaria juncea*					x			x
FABACEAE	*Crotalaria medicaginea*						x	x	
FABACEAE	*Crotalaria medicaginea var. neglecta*								x
FABACEAE	*Crotalaria montana*						x	x	x
FABACEAE	*Crotalaria montana var. angustifolia*								x
FABACEAE	*Crotalaria novae-hollandiae*						x	x	
FABACEAE	*Crotalaria novae-hollandiae subsp. novae-hollandiae*							x	
FABACEAE	*Crotalaria retusa*						x	x	x
FABACEAE	*Crotalaria sp.*					x			
FABACEAE	*Cullen badocanum*						x		
FABACEAE	*Desmodium brownii*								x
FABACEAE	*Desmodium filiforme*						x		

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
FABACEAE	*Desmodium flagellare*					x	x	x	x
FABACEAE	*Desmodium glareosum*					x			x
FABACEAE	*Desmodium muelleri*					x		x	x
FABACEAE	*Desmodium muelleri var. majus*						x		
FABACEAE	*Desmodium pullenii*								x
FABACEAE	*Erythrina variegata var. orientalis*	Not Evaluated					x		
FABACEAE	*Erythrophleum chlorostachys*					x	x	x	x
FABACEAE	*Flemingia parviflora*						x		
FABACEAE	*Flemingia pauciflora*					x		x	x
FABACEAE	*Galactia tenuiflora*					x		x	x
FABACEAE	*Glycine sp.*					x			
FABACEAE	*Indigofera colutea*								x
FABACEAE	*Indigofera glandulosa*	Not Evaluated				x		x	
FABACEAE	*Indigofera linifolia*						x	x	x
FABACEAE	*Macroptilium atropurpureum*	Introduced					x		
FABACEAE	*Macroptilium lathyroides*	Introduced					x	x	
FABACEAE	*Neptunia gracilis f. gracilis*							x	
FABACEAE	*Rhynchosia minima*						x	x	x
FABACEAE	*Senna cladophylla*								x
FABACEAE	*Senna obtusifolia*	Introduced					x	x	
FABACEAE	*Sesbania cannabina*	Infraspecific				x	x	x	x
FABACEAE	*Stylosanthes hamata*	Introduced					x	x	
FABACEAE	*Tephrosia filipes*					x		x	x
FABACEAE	*Tephrosia filipes var. indeterminate*						x		
FABACEAE	*Tephrosia humifusa*	Near Threatened			Yes		x		
FABACEAE	*Tephrosia leptoclada*						x		x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
FABACEAE	*Tephrosia polyzyga*					x	x		
FABACEAE	*Tephrosia remotiflora*								x
FABACEAE	*Uraria lagopodioides*						x	x	x
FABACEAE	*Vachellia pachyphloia*					x			x
FABACEAE	*Vachellia pallidifolia*							x	x
FABACEAE	*Vachellia valida*								x
FABACEAE	*Vigna lanceolata*						x		
FABACEAE	*Vigna lanceolata var. filiformis*								x
FABACEAE	*Vigna radiata*						x		
FABACEAE	*Vigna radiata var. sublobata*								x
FABACEAE	*Vigna sp. Station Creek*								x
FABACEAE	*Vigna vexillata*						x		
FABACEAE	*Zornia muriculata*					x			
FABACEAE	*Zornia muriculata subsp. angustata*						x		x
GOODENIACEAE	*Goodenia hispida*			YES		x			x
GOODENIACEAE	*Goodenia leiosperma*			YES		x	x	x	x
GOODENIACEAE	*Goodenia sp. Melville Island*						x	x	
GOODENIACEAE	*Goodenia spp.*						x		
HERNANDIACEAE	*Gyrocarpus americanus*								x
LAMIACEAE	*Anisomeles brevispinosa*	Not Evaluated				x		x	x
LAMIACEAE	*Anisomeles malabarica*						x		
LAMIACEAE	*Mesosphaerum suaveolens*	Introduced				x	x	x	x
LAMIACEAE	*Premna acuminata*								x
LAMIACEAE	*Vitex glabrata*					x			
LECYTHIDACEAE	*Planchonia careya*							x	x
LOGANIACEAE	*Mitrasacme connata*					x			x
LOGANIACEAE	*Mitrasacme nudicaulis*						x		

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
LOGANIACEAE	*Mitrasacme nudicaulis var. nudicaulis*							x	
MALVACEAE	*Abutilon spp.*						x		
MALVACEAE	*Brachychiton diversifolius*							x	x
MALVACEAE	*Brachychiton diversifolius subsp. diversifolius*								x
MALVACEAE	*Brachychiton megaphyllus*			YES				x	x
MALVACEAE	*Corchorus aestuans*								x
MALVACEAE	*Gossypium australe*						x		
MALVACEAE	*Grewia retusifolia*							x	x
MALVACEAE	*Hibiscus austrinus*								x
MALVACEAE	*Hibiscus meraukensis*							x	
MALVACEAE	*Hibiscus multilobatus*					x		x	x
MALVACEAE	*Hibiscus panduriformis*						x		
MALVACEAE	*Malvastrum sp.*	Not Evaluated				x			
MALVACEAE	*Melhania oblongifolia*								x
MALVACEAE	*Melochia corchorifolia*								x
MALVACEAE	*Sida acuta*	Introduced						x	x
MALVACEAE	*Sida cordifolia*	Introduced					x	x	
MALVACEAE	*Sida rhombifolia*	Introduced						x	x
MALVACEAE	*Sida spinosa*	Introduced					x		x
MALVACEAE	*Sida spinosa*					x	x	x	
MALVACEAE	*Waltheria indica*							x	x
MENISPERMACEAE	*Tinospora smilacina*						x		
MIMOSACEAE	*Acacia holosericea*						x	x	
MIMOSACEAE	*Acacia umbellata*						x	x	
MIMOSACEAE	*Vachellii pallidifolia*						x		

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
MORACEAE	*Ficus aculeata*							x	x
MORACEAE	*Ficus aculeata var. aculeata*								x
MORACEAE	*Ficus racemosa*						x		
MYRTACEAE	*Calytrix achaeta*								x
MYRTACEAE	*Calytrix exstipulata*							x	x
MYRTACEAE	*Corymbia abbreviata*								x
MYRTACEAE	*Corymbia bella*						x	x	x
MYRTACEAE	*Corymbia confertiflora*						x	x	x
MYRTACEAE	*Corymbia curtipes*					x			x
MYRTACEAE	*Corymbia dichromophloia*						x	x	
MYRTACEAE	*Corymbia ferruginea*						x	x	
MYRTACEAE	*Corymbia foelscheana*						x	x	x
MYRTACEAE	*Corymbia latifolia*						x	x	x
MYRTACEAE	*Corymbia grandifolia*							x	x
MYRTACEAE	*Corymbia polysciada*			YES					x
MYRTACEAE	*Corymbia terminalis*					x		x	x
MYRTACEAE	*Eucalyptus alba var. australasica*							x	
MYRTACEAE	*Eucalyptus distans*			YES		x		x	x
MYRTACEAE	*Eucalyptus patellaris*			YES			x	x	x
MYRTACEAE	*Eucalyptus pruinosa*						x	x	
MYRTACEAE	*Eucalyptus tectifica*						x	x	x
MYRTACEAE	*Eucalyptus tetrodonta*						x	x	
MYRTACEAE	*Lophostemon grandiflorus*							x	x
MYRTACEAE	*Lophostemon lactifluus*						x		
MYRTACEAE	*Melaleuca dealbata*							x	x
MYRTACEAE	*Melaleuca minutifolia*					x			x
MYRTACEAE	*Melaleuca leucadendra*							x	x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
NYCTAGINACEAE	*Boerhavia paludosa*					x			x
NYCTAGINACEAE	*Boerhavia spp.*						x		
OLEACEAE	*Jasminum molle*						x		x
OROBANCHACEAE	*Buchnera asperata*					x			x
ORCHIDACEAE	*Cymbidium canaliculatum*							x	
PANDANACEAE	*Pandanus spiralis*						x	x	x
PASSIFLORACEAE	*Passiflora foetida*	Introduced					x		
PEDALIACEAE	*Sesamum indicum*	Introduced					x		x
PHYLLANTHACEAE	*Antidesma ghesaembilla*							x	x
PHYLLANTHACEAE	*Breynia cernua*								x
PHYLLANTHACEAE	*Bridelia tomentosa*								x
PHYLLANTHACEAE	*Flueggea virosa subsp. melanthesoides*							x	x
PHYLLANTHACEAE	*Notoleptopus decaisnei*								x
PHYLLANTHACEAE	*Phyllanthus exilis*					x		x	x
PHYLLANTHACEAE	*Phyllanthus lacerosus*	Data Deficient			Yes	x		x	x
PHYLLANTHACEAE	*Phyllanthus maderaspatanus*					x		x	x
PHYLLANTHACEAE	*Phyllanthus prominulatus*	Data Deficient		YES	Yes				x
PICRODENDRACEAE	*Petalostigma banksii*								x
PICRODENDRACEAE	*Petalostigma pubescens*								x
PLANTAGINACEAE	*Stemodia lythrifolia*								x
POACEAE	*Alloteropsis semialata*						x		x
POACEAE	*Aristida holathera*							x	x
POACEAE	*Aristida holathera var. holathera*								x
POACEAE	*Aristida hygrometrica*								x
POACEAE	*Aristida ingrata*								x
POACEAE	*Aristida latifolia*								x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
POACEAE	*Aristida pruinosa*								x
POACEAE	*Aristida spp.*						x		
POACEAE	*Bothriochloa bladhii subsp. bladhii*						x		
POACEAE	*Bothriochloa pertusa*	Introduced				x	x		
POACEAE	*Brachyachne convergens*						x	x	x
POACEAE	*Cenchrus polystachios*	Introduced					x		
POACEAE	*Cenchrus pedicellatus*	Introduced					x		
POACEAE	*Chionachne hubbardiana*						x		
POACEAE	*Chrysopogon fallax*						x	x	x
POACEAE	*Chrysopogon latifolius*								x
POACEAE	*Chrysopogon oliganthus*						x		
POACEAE	*Cymbopogon bombycinus*					x			x
POACEAE	*Dichanthium fecundum*						x		x
POACEAE	*Dichanthium sericeum*								x
POACEAE	*Dichanthium sericeum subsp. polystachyum*								x
POACEAE	*Echinochloa colona*	Introduced					x		x
POACEAE	*Enneapogon pallidus*							x	
POACEAE	*Enneapogon polyphyllus*								x
POACEAE	*Eragrostis cumingii*								x
POACEAE	*Eragrostis schultzii*						x		
POACEAE	*Eriachne avenacea*								x
POACEAE	*Eriachne ciliata*								x
POACEAE	*Eriachne obtusa*								x
POACEAE	*Heteropogon contortus*						x	x	x
POACEAE	*Heteropogon triticeus*								x
POACEAE	*Imperata cylindrica*								x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
POACEAE	*Iseilema macratherum*						x		x
POACEAE	*Mnesithea formosa*						x	x	x
POACEAE	*Panicum mindanaense*								x
POACEAE	*Perotis rara*								x
POACEAE	*Pseudoraphis spinescens*								x
POACEAE	*Sarga intrans*						x		
POACEAE	*Schizachyrium fragile*							x	x
POACEAE	*Sehima nervosum*								x
POACEAE	*Sehima nervosum*						x		
POACEAE	*Setaria apiculata*						x		x
POACEAE	*Sorghum (annual, sterile)*							x	
POACEAE	*Sorghum plumosum*							x	x
POACEAE	*Sorghum plumosum var. plumosum*								x
POACEAE	*Sorghum stipoideum*								x
POACEAE	*Sporobolus australasicus*								x
POACEAE	*Themeda quadrivalvia*	Introduced					x		
POACEAE	*Themeda triandra*						x	x	x
POACEAE	*Urochloa holosericea*								x
POACEAE	*Urochloa holosericea subsp. holosericea*								x
POACEAE	*Urochloa pubigera*								x
POACEAE	*Urochloa subquadripara*								x
POACEAE	*Whiteochloa capillipes*								x
POACEAE	*Yakirra australiensis var. australiensis*						x		
POLYGALACEAE	*Polygala barbata*					x	x	x	x
POLYGALACEAE	*Polygala integra*					x	x	x	x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
POLYGALACEAE	*Polygala spp.*						x		
PORTULACACEAE	*Portulaca filifolia*					x			
PROTEACEAE	*Grevillea mimosoides*							x	x
PROTEACEAE	*Hakea arborescens*						x	x	x
PROTEACEAE	*Persoonia falcata*						x		x
PROTEACEAE	*Stenocarpus acacioides*								x
RUBIACEAE	*Gardenia ewartii subsp. ewartii*								x
RUBIACEAE	*Gardenia fucata*								x
RUBIACEAE	*Gardenia megasperma*							x	x
RUBIACEAE	*Nauclea orientalis*								x
RUBIACEAE	*Oldenlandia argillacea*					x			x
RUBIACEAE	*Oldenlandia mitrasacmoides*						x		
RUBIACEAE	*Oldenlandia mitrasacmoides subsp. mitrasacmoides*								x
RUBIACEAE	*Pavetta brownii var. brownii*						x		
RUBIACEAE	*Spermacoce argillacea*					x			x
RUBIACEAE	*Spermacoce dolichosperma*						x		
RUBIACEAE	*Spermacoce pogostoma*					x	x	x	x
RUBIACEAE	*Spermacoce tectanthera*						x		
RUBIACEAE	*Timonius timon*						x		x
SANTALACEAE	*Exocarpos latifolius*								x
SANTALACEAE	*Santalum lanceolatum*								x
SAPINDACEAE	*Dodonaea lanceolata*								x
SAPOTACEAE	*Sersalisia sericea*								x
SCROPHULARIACEAE	*Stemodia viscosa*						x		
SCROPHULARIACEAE	*Striga curviflora*						x		
SOLANACEAE	*Solanum dioicum*					x			x

Family Name	Scientific Name	Status NT	Status EPBC	NT Endemic	Significant Species	NRM InfoNet 2019	EcoScience NT (2007)	EcoScience NT (2019)	VSD & Holtze (2019)
STERCULIACEAE	*Brachychiton diversifolius subsp. diversifolius*						x		
STERCULIACEAE	*Brachychiton megaphyllus*						x		
STERCULIACEAE	*Helicteres spp.*						x		
STERCULIACEAE	*Waltheria indica*						x		
TACCACEAE	*Tacca leontopetaloides*						x		x
THYMELAEACEAE	*Pimelea concreta*					x			x
THYMELAEACEAE	*Thecanthes concreta*						x		
TILIACEAE	*Grewia retusifolia*						x		
TILIACEAE	*Triumfetta rhomboidea*						x		
VERBENACEAE	*Clerodendrum floribundum*						x		
VIOLACEAE	*Hybanthus enneaspermus*						x		x
VITACEAE	*Ampelocissus acetosa*						x		
VITACEAE	*Ampelocissus frutescens*			YES			x	x	x
VITACEAE	*Cayratia maritima*						x		
VITACEAE	*Cayratia trifolia*						x	x	x

APPENDIX 1.3 SUMMARY TABLE OF ECOSCIENCE NT FLORA SITES (FULL FLORISTIC) AND CHECK SITES (MAPPING)

Site ID	Easting	Northing	Mapping unit	Site description
20m X 20m Quadrats (MC)				
MC1	225561	8400603	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, C. confertiflora* and *E patellaris low open woodland to mid- high woodland on depositional plains*
MC2	224999	8401748	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
MC3	224764	8401742	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
MC4	225357	8401434	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
MC5	225712	8401460	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
MC6	225455	8401286	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains
MC7	225659	8402146	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to low open woodland on sandy loams and red earths on undulating terrain
MC8	225952	8402530	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
MC9	224798	8402332	VMU 4c	*Terminalia platyphylla* low open woodland to grassland
MC10	223722	8401638	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
MC11	224135	8401456	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to low open woodland on sandy loams and red earths on undulating terrain
MC12	226331	8400826	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
MC13	224542	8401182	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains

Site ID	Easting	Northing	Mapping unit	Site description
MC14	223080	8400410	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains
MC17	224958	8402624	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
MC18	226157	8401776	VMU 2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid open woodland and woodland on rocky rises
MC19	225548	8401279	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains
MC20	224948	8401359	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains
Mapping Check Sites (GT)				
GT1	223881	8401626	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
GT2	223625	8401622	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
GT3	223475	8401620	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
GT4	223864	8402012	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
GT5	223519	8402168	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
GT6	223454	8402564	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
GT7	223643	8402474	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains
GT8	225527	8402056	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
GT9	225630	8402462	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains

Site ID	Easting	Northing	Mapping unit	Site description
GT10	225483	8402733	VMU2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills
GT11	225215	8402686	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
GT12	224897	8402646	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
GT13	225002	8402520	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
GT24	224044	8402394	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
GT26	224338	8402564	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains
GT27	225818	8402848	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
GT28	225627	8403184	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
GT29	225316	8403440	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
Mapping Check Sites (ES)				
ES1	225960	8396370	VMU2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills
ES2	225810	8402772	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
ES3	225780	8402733	VMU2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills
ES4	225825	8402522	VMU2c	*Eucalyptus tectifica* and *Corymbia foelscheana, Erythrophleum chlorostachys* low woodland to mid-high open woodland on undulating low hills
ES5	226123	8402245	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
ES6	226110	8401664	VMU 2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid open woodland and woodland on rocky rises
ES7	225200	8401883	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES8	225050	8402248	VMU 4c	*Terminalia platyphylla* low open woodland to grassland

Site ID	Easting	Northing	Mapping unit	Site description
ES9	224580	8402608	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
ES10	224357	8402589	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains
ES11	223979	8402494	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES12	223630	8402523	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES13	223346	8402578	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
ES14	225101	8399835	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
ES15	225120	8400122	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES16	224996	8400151	VMU 4b	*Lophostemon grandiflorus, Corymbia grandifolia, E. tectifica* and *Terminalia platyphylla* mid-high open woodland on minor creeks
ES17	224392	8400150	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES18	226102	8399652	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES19	226159	8401722	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES20	226159	8401722	VMU 2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid open woodland and woodland on rocky rises
ES21	225343	8403341	VMU 2b	*Corymbia foelscheana* and *Eucalyptus distans* low to mid open woodland and woodland on rocky rises
ES22	225401	8403388	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
ES23	225340	8403350	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
ES24	225338	8403329	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
ES25	225036	8402255	VMU 4a	*Corymbia bella, Melaleuca spp.* and *Terminalia platyphylla* mid woodland on major drainage lines
ES26	225105	8401798	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains

Site ID	Easting	Northing	Mapping unit	Site description
ES27	225429	8401801	VMU 3b(ii)	*Eucalyptus pruinosa* low open woodland to low woodland on low-lying sandy plains
ES28	226115	8400010	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES29	225071	8398877	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES30	225783	8399079	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES31	226059	8399197	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES32	226071	8399648	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES33	226133	8400462	VMU3b(i)	*E. tectifica, Corymbia foelscheana* with *C. grandifolia, Hakea arborescens* and *Erythrophleum chlorostachys* low woodland, low open woodland to shrubland on poorly drained alluvial plains
ES34	225812	8401196	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
ES35	225721	8401366	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
ES36	225583	8401261	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains
ES37	226056	8400328	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains
ES38	225547	8403265	VMU 3a(i)	*E. tectifica* with *Erythrophleum chlorostachys* and mixed species low woodland to mid open woodland on sandy loams and red earths on undulating terrain
ES39	225256	8398524	VMU 3a(ii)	*Corymbia foelscheana, Corymbia terminalis, Eucalyptus confertiflora, E patellaris* low open woodland to mid-high woodland on depositional plains

APPENDIX 1.4 SURVEY OF GRASSES OF POTENTIAL CONSERVATION IMPORTANCE (FOOD RESOURCE FOR GOULDIAN FINCH)

GPS	GPS location		Vegetation	General Location	Species	Abundance/Density			General Comments
Waypoint #	Lat/Long		Community						
	Lat	Long	Dominant tree species	e.g. main access track, minor track, disturbed area	ego A. semialata	Patch size	% ground cover of patch	Density category	e.g.: disturbed area, grass flowering/fruiting, fire history
46	-14.46584°	132.45013°	Corymbia sp. (latifolia/bleeseri), Euc tectifica Medium woodland	Along cleared fence-line through woodland.	1. A. semialata	100mx150m	total gnd cover. 80%	of A.s	Area is heavily disturbed (grazed and/or burnt) resulting in 'green carpet' cover of immature grasses. 20 *A. semialata* plants observed, mostly immature, 1 in flower. most plants with 3 racemes, stem <30cm
					2. Sarga sp			1	
					3. Cynodon sp.			(may promote with maturity)	
49	-14.46420°	132.45059°	Low-sparse woodland (regrowth) Acacia sp. Corymbia sp.	Site located just off fence line near drainage gully and runs to the ESE of fence through low lying drainage area	1. A. semialata	50mx200m	TOTAL cover (all grasses)	of A.s	A sparse area (again, disturbed) with cover only regrowth at immature stage.
					2. Cynodon sp.	(likely to extend further)	50%	1	10 Immature *A. semialata* plants found all <30cm high
					3. other pasture species			of general cover	
								4	
50	-14.44261°	132.46275°	Woodland, Euc. tectifica, Corymbia sp (latifolia). also present;	Eastern side of fence line corner, eastward down gully line/depression	1. Themeda triandra	200mx200m	*T. triandra* 80%	Of A.s	Area in much better condition than all previous sites, i.e. burn was early in 2018, grass cover good with mature grasses seeding.

GPS	GPS location		Vegetation	General Location	Species	Abundance/Density			General Comments
Waypoint #	Lat/Long		Community						
	Lat	Long	Dominant tree species	e.g. main access track, minor track, disturbed area	ego A. semialata	Patch size	% ground cover of patch	Density category	e.g.: disturbed area, grass flowering/fruiting, fire history
			Terminalia sp and Ampelocissus sp.	among gentle surrounding slopes.	2. Chrysopogon fallax		*C. fallax* 17%	2	Some mature and flowering *A. semialata* found, the rest is immature. Area has good covering of *Themeda* with seeding *Chrysopogon* well dispersed amongst it. Most grass height is <1m, indicating regrowth from earlier burn, (as opposed to the later 'storm burning' of the other sites.
					3. A. semialata		*A. semialata* 3%		Fauna present. Birds; Silver-crowned Friarbird, Common Bronzewing, Pied Butcherbird, Brown Quail, Great Bowerbird
53	-14.43335°	132.45349°	Corymbia sp. Euc. tectifica, Terminalia sp.	In greater survey area to the north. on main track 100m due south of fence line at base of hill line	Alloteropsis semialata, Themeda triandra	50mx100m	*A. semialata* - <10%	of A.s	Area disturbed by feral animals (Water Buffalo and Pig). 'Carpet-like' stage of undergrowth renewal suggests degradation by fire, feral animals and/or both.
							T.t – 70%	1	A. semialata is thinly disbursed amongst *Themeda triandra*, some mature plants that are seeding

APPENDIX 2 TERRESTRIAL FAUNA OF THE MAUD CREEK MINE AREA – COMBINED RECORDS

VU = vulnerable; NT = near threatened; DD = data deficient; C = camera trap record; EX = exotic/introduced species

Common Name	Scientific Name	Status	Martin Maud Ck Mine Lease Sep 1994	Martin Maud Ck Mine Lease May 1996	Martin Access Route July 1997	NTG Cutta Cutta Caves (NT PWS 2000)	EMS Maud Creek 2007	ALA Data Search 2019 5km	NTG Fauna Atlas Search 2019 5km	Maud Creek Study Area 2018-19
Amphibians										
Giant Frog	*Cyclorana australis*					X				
Bilingual Froglet	*Crinia bilingua*			X			X	X	X	
Stonemason Toadlet	*Uperoleia lithomoda*			X		X	X	X	X	
Northern Spadefoot	*Notaden melanoscaphus*					X				
Marbled Frog	*Limnodynastes convexiusculus*					X				C
Ornate Burrowing Frog	*Platyplectrum ornatum*	*DD*		X		X	X	X	X	
Green Tree Frog	*Litoria caerulea*					X				C
Copland's Rock Frog	*Litoria coplandi*					X				
Bumpy Rocketfrog	*Litoria inermis*			X		X	X	X	X	
Rockhole Frog	*Litoria meiriana*			X			X	X	X	
Striped Rocketfrog	*Litoria nasuta*						X	X	X	
Roth's Tree Frog	*Litoria rothii*						X	X	X	
Purple Tree Frog	*Litoria rubella*					X				
Tornier's Frog	*Litoria tornieri*						X	X	X	
Splendid Tree Frog	*Litoria splendida*					X				
Wotjulum Frog	*Litoria wotjulumensis*					X	X	X	X	
Cane Toad	*Rhinella marina*	*EX*						X		C
	17	2	0	5	0	11	9	10	9	3
Reptiles										
Northern Dtella	*Gehyra australis*					X	X	X	X	X
Northern Spotted Rock Dtella	*Gehyra nana*				X	X	X	X	X	
Bynoe's Gecko	*Heteronotia binoei*				X	X	X	X	X	X
Marbled Velvet Gecko	*Oedura marmorata*					X				

Common Name	Scientific Name	Status	Martin Maud Ck Mine Lease Sep 1994	Martin Maud Ck Mine Lease May 1996	Martin Access Route July 1997	NTG Cutta Cutta Caves (NT PWS 2000)	EMS Maud Creek 2007	ALA Data Search 2019 5km	NTG Fauna Atlas Search 2019 5km	Maud Creek Study Area 2018-19
Spiny-tailed Gecko	*Strophurus ciliaris*				X	X	X	X		
Northern Hooded Scalyfoot	*Pygopus steelescotti*					X				
Burton's Legless Lizard	*Lialis burtonis*						X	X	X	
Chameleon Dragon	*Chelosania brunnea*	*NT*				X				
Frilled Lizard	*Chlamydosaurus kingii*					X				
White-lipped Two-lined Dragon	*Diporiphora albilabris*					X				
Two-lined Dragon	*Diporiphora bilineata*			X		X	X	X	X	X
Yellow-sided Two-lined Dragon	*Diporiphora magna*					X	X	X	X	
Gilbert's Dragon	*Lophognathus gilberti*			X			X	X	X	C
Black-spotted Ridge-tailed Monitor	*Varanus baritji*	*DD*			X			X	X	
Black-palmed Monitor	*Varanus glebopalma*	*DD*				X				
Gould's Monitor	*Varanus gouldii*			X	X			X	X	
Mertens' Water Monitor	*Varanus mertensi*	*VU*		X				X	X	
Mitchell's Water Monitor	*Varanus mitchelli*					X				
Black-tailed Monitor	*Varanus tristis*					X				
Two-spined Rainbow Skink	*Carlia amax*					X				
Slender Rainbow Skink	*Carlia gracilis*						X	X	X	
Shaded-litter Rainbow Skink	*Carlia munda*			X	X		X	X	X	C
Red-Sided Rainbow Skink	*Carlia rufilatus*						X	X	X	
Three-spined Rainbow Skink	*Carlia tricantha*					X	X	X	X	
Metallic Snake-eyed Skink	*Cryptoblepharus metallicus*					X				X
Plain Ctenotus	*Ctenotus inornatus*			X	X		X	X	X	X
Robust Ctenotus	*Ctenotus robustus*						X	X	X	
Rock Ctenotus	*Ctenotus saxatilis*					X				
Spalding's Ctenotus	*Ctenotus spaldingi*					X				
Eastern Lerista	*Lerista orientalis*					X				
Grey's Menetia	*Menetia greyii*					X				
Main's Menetia	*Menetia maini*					X				
Smooth-scaled Skink	*Eremiascincus isolepis*					X				

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Children's Python	*Antaresia childreni*	*DD*					X	X	X	X
Olive Python	*Liasis olivaceus*									C
Keelback	*Tropidonophis mairii*							X	X	
Brown Tree Snake	*Boiga irregularis*	*DD*				X				
Common Tree Snake	*Dendrelaphis punctulatus*	*DD*		X			X	X	X	X
Little Spotted Snake	*Suta punctata*					X				
Greater Black Whipsnake	*Demansia papuensis*	*DD*		X						
Lesser Black Whipsnake	*Demansia vestigiata*	*DD*						X	X	
King Brown Snake	*Pseudechis australis*	*NT*				X				
Claw-snouted Blind-snake	*Anilios unguirostris*					X				
Narrow-banded Bandy Bandy	*Vermicella multifasciata*	*DD*				X				
	44	11	0	8	7	28	16	21	20	10
Birds										
Emu	*Dromaius novaehollandiae*	*NT*				X				
Common Bronzewing	*Phaps chalcoptera*					X	X	X	X	X
Diamond Dove	*Geopelia cuneata*						X	X	X	X
Peaceful Dove	*Geopelia striata*					X	X	X	X	C
Bar-shouldered Dove	*Geopelia humeralis*						X	X	X	C
Crested Pigeon	*Ocyphaps lophotes*						X	X	X	
Pied Imperial-Pigeon	*Ducula bicolor*		X	X	X	X				
Stubble Quail	*Coturnix pectoralis*				X					
Little Button-quail	*Turnix velox*			X						
Chestnut-backed Button-quail	*Turnix castanota*	*DD*				X				
Red-backed Button-quail	*Turnix maculosa*			X	X		X	X	X	
Plumed Whistling-Duck	*Dendrocygna eytoni*					X				
Radjah Shelduck	*Radjah radjah*			X						
Pacific Black Duck	*Anas superciliosa*					X				X
Grey Teal	*Anas gracilis*					X				
Green Pygmy-goose	*Nettapus pulchellus*		X	X	X	X				

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Great Cormorant	*Phalacrocorax carbo*			X		X			X	
Pied Cormorant	*Phalacrocorax varius*				X	X				
Little Pied Cormorant	*Phalacrocorax melanoleucos*					X			X	
Great Crested Grebe	*Podiceps cristatus*		X	X	X	X				
Australasian Grebe	*Tachybaptus novaehollandiae*		X	X		X				
White-faced Heron	*Egretta novaehollandiae*		X				X		X	
White-necked Heron	*Ardea pacifica*						X	X	X	
Pied Heron	*Ardea picata*		X			X				
Great-billed Heron	*Ardea sumatrana*			X	X	X				
Cattle Egret	*Ardea ibis*		X	X	X	X				X
Eastern Great Egret	*Ardea modesta*			X				X	X	
Intermediate Egret	*Ardea intermedia*		X		X	X				X
White-necked Heron	*Ardea pacifica*					X				X
Black Bittern	*Ixobrychus flavicollis*		X	X	X	X				
Nankeen Night Heron	*Nycticorax caledonicus*							X		
Black-necked Stork	*Ephippiorhynchus asiaticus*					X		X	X	
Australian White Ibis	*Threskiornis moluccus*							X	X	
Straw-necked Ibis	*Threskiornis spinicollis*							X	X	
Black-breasted Buzzard	*Hamirostra melanosternon*							X	X	
Black Kite	*Milvus migrans*		X	X	X	X	X	X	X	X
Whistling Kite	*Haliastur sphenurus*			X			X	X	X	X
Square-tailed Kite	*Lophoictinia isura*	*NT*	X	X	X	X				X
Spotted Harrier	*Circus assimilis*					X	X	X	X	
Swamp Harrier	*Circus approximans*		X	X		X				
Brown Goshawk	*Accipiter fasciatus*						X	X	X	X
Red Goshawk	*Erythrotriorchis radiatus*	*VU*		X		X	X	X	X	
Collared Sparrowhawk	*Accipiter cirrhocephalus*					X		X	X	
White-bellied Sea-eagle	*Haliaeetus leucogaster*		X	X						X
Wedge-tailed Eagle	*Aquila audax*							X	X	C

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Black Falcon	*Falco subniger*						X	X	X	
Brown Falcon	*Falco berigora*					X	X	X	X	X
Peregrine Falcon	*Falco peregrinus*			X				X	X	
Australian Hobby	*Falco longipennis*						X	X	X	
Nankeen Kestrel	*Falco cenchroides*				X	X				X
Brolga	*Grus rubicunda*							X	X	X
Australian Bustard	*Ardeotis australis*	*NT*	X	X	X	X		X	X	X
Bush Stone-curlew	*Burhinus grallarius*	*NT*					X	X	X	X
Australian Pratincole	*Stiltia isabella*		X							
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*						X	X	X	X
Galah	*Eolophus roseicapilla*						X	X	X	X
Sulphur-crested Cockatoo	*Cacatua galerita*		X	X	X		X	X	X	X
Cockatiel	*Nymphicus hollandicus*					X	X	X	X	X
Little Corella	*Cacatua sanguinea*							X	X	
Red-collared Lorikeet	*Trichoglossus rubritorquis*						X	X		X
Varied Lorikeet	*Psitteuteles versicolor*		X			X	X	X	X	X
Red-winged Parrot	*Aprosmictus erythropterus*						X	X	X	X
Northern Rosella	*Platycercus venustus*		X	X	X	X	X	X	X	
Hooded Parrot	*Psephotus dissimilis*	*NT*				X	X	X	X	X
Brush Cuckoo	*Cuculus variolosus*						X	X	X	X
Pallid Cuckoo	*Cuculus pallidus*					X		X	X	
Horsfield's Bronze-Cuckoo	*Chalcites basalis*			X			X	X	X	
Channel-billed Cuckoo	*Scythrops novaehollandiae*				X	X				X
Pheasant Coucal	*Centropus phasianus*									X
Barking Owl	*Ninox connivens*				X	X	X	X	X	
Southern Boobook	*Ninox novaeseelandiae*					X	X	X	X	X
Tawny Frogmouth	*Podargus strigoides*		X		X	X	X	X	X	X
Spotted Nightjar	*Eurostopodus argus*		X	X	X	X		X	X	X
Australian Owlet-nightjar	*Aegotheles cristatus*						X		X	X

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Little Kingfisher	*Alcedo pusilla*			X	X					
Azure Kingfisher	*Alcedo azurea*		X			X	X	X	X	X
Blue-winged Kookaburra	*Dacelo leachii*						X	X	X	X
Red-backed Kingfisher	*Todiramphus pyrrhopygia*						X	X	X	X
Sacred Kingfisher	*Todiramphus sanctus*		X	X		X	X	X	X	
Forest Kingfisher	*Todiramphus macleayi*			X		X	X	X	X	X
Rainbow Bee-eater	*Merops ornatus*					X	X	X	X	X
Black-tailed Treecreeper	*Climacteris melanura*							X	X	
Red-backed Fairy-wren	*Malurus melanocephalus*						X	X	X	X
Purple-backed Fairy-wren	*Malurus assimilis*			X		X				
Striated Pardalote	*Pardalotus striatus*					X	X	X	X	X
Weebill	*Smicrornis brevirostris*						X	X	X	X
Large-billed Gerygone	*Gerygone magnirostris*		X	X	X	X				
White-throated Gerygone	*Gerygone olivacea*			X			X	X	X	X
Green-backed Gerygone	*Gerygone chloronotus*					X		X	X	
Helmeted Friarbird	*Philemon buceroides*		X	X	X	X				
Silver-crowned Friarbird	*Philemon argenticeps*						X	X	X	X
Little Friarbird	*Philemon citreogularis*						X	X	X	X
Blue-faced Honeyeater	*Entomyzon cyanotis*						X	X	X	X
White-gaped Honeyeater	*Stomiopera unicolor*						X	X	X	X
White-lined Honeyeater	*Meliphaga albilineata*	*NT*	X	X	X	X				
Yellow-tinted Honeyeater	*Ptilotula flavescens*						X	X	X	X
White-throated Honeyeater	*Melithreptus albogularis*		X	X	X	X		X	X	X
Brown Honeyeater	*Lichmera indistincta*					X	X	X	X	X
Rufous-throated Honeyeater	*Conopophila rufogularis*							X	X	X
Bar-breasted Honeyeater	*Ramsayornis fasciatus*		X	X	X	X		X	X	X
Banded Honeyeater	*Certhionyx pectoralis*		X	X	X	X		X	X	X
Dusky Honeyeater	*Myzomela obscura*		X	X	X	X		X	X	
Jacky Winter	*Microeca fascinans*		X	X		X	X	X	X	

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Lemon-bellied Flycatcher	*Microeca flavigaster*						X	X	X	X
Buff-sided Robin	*Poecilodryas cerviniventris*	*NT*		X				X	X	
Grey-crowned Babbler	*Pomatostomus temporalis*		X	X	X	X	X	X	X	X
Varied Sittella	*Daphoenositta chrysoptera*					X	X	X	X	
Rufous Whistler	*Pachycephala rufiventris*						X	X	X	X
Grey Shrike-thrush	*Colluricincla harmonica*				X		X	X	X	X
Sandstone Shrike-thrush	*Colluricincla woodwardi*			X	X					
Leaden Flycatcher	*Myiagra rubecula*		X	X	X	X	X	X	X	X
Shining Flycatcher	*Myiagra alecto*							X	X	
Paperbark Flycatcher	*Myiagra nana*						X	X		X
Magpie-lark	*Grallina cyanoleuca*					X	X	X	X	C
Northern Fantail	*Rhipidura rufiventris*						X	X	X	X
Willie Wagtail	*Rhipidura leucophrys*						X	X	X	X
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*						X	X	X	X
White-bellied Cuckoo-shrike	*Coracina papuensis*						X	X	X	X
Cicadabird	*Coracina tenuirostris*			X		X				
White-winged Triller	*Lalage sueurii*						X	X	X	X
Varied Triller	*Lalage leucomela*		X	X	X					
Olive-backed Oriole	*Oriolus sagittatus*				X	X	X	X	X	X
Great Bowerbird	*Chlamydera nuchalis*		X	X	X	X	X	X	X	X
White-breasted Woodswallow	*Artamus leucorhynchus*						X	X	X	
Masked Woodswallow	*Artamus personatus*		X			X		X	X	X
White-browed Woodswallow	*Artamus superciliosus*			X		X				
Black-faced Woodswallow	*Artamus cinereus*					X	X	X	X	
Little Woodswallow	*Artamus minor*							X	X	X
Pied Butcherbird	*Cracticus nigrogularis*						X	X	X	X
Grey Butcherbird	*Cracticus torquatus*			X				X	X	
Australian Magpie	*Gymnorhina tibicen*		X	X	X	X				X
Torresian Crow	*Corvus orru*			X		X	X	X	X	X

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Apostlebird	*Struthidea cinerea*			X	X	X	X	X		
Australian Pipit	*Anthus novaeseelandiae*			X	X	X				
Crimson Finch	*Neochmia phaeton*							X	X	X
Zebra Finch	*Taeniopygia guttata*		X			X	X	X	X	
Double-barred Finch	*Stizoptera bichenovii*			X	X	X	X	X	X	X
Long-tailed Finch	*Poephila acuticauda*					X	X	X	X	X
Masked Finch	*Poephila personata*						X	X	X	X
Chestnut-breasted Mannikin	*Lonchura castaneothorax*					X	X	X	X	
Yellow-rumped Mannikin	*Lonchura flaviprymna*	*NT*	X	X	X	X				
Star Finch	*Neochmia ruficauda*	*NT*	X	X	X	X				
Painted Finch	*Emblema pictum*			X	X					
Mistletoebird	*Dicaeum hirundinaceum*						X	X	X	X
Tawny Grassbird	*Megalurus timoriensis*					X		X	X	
	145	11	40	55	42	77	75	101	101	77
Mammals										
Short-beaked Echidna	*Tachyglossus aculeata*				X	X	X	X	X	C
Northern Quoll	*Dasyurus hallucatus*	*CR*				X				
Common Planigale	*Planigale maculata*					X				
Long-tailed Planigale	*Planigale ingrami*									C
Sugar Glider	*Petaurus breviceps ariel*				X			X	X	
Northern Brushtail Possum	*Trichosurus vulpecula arnhemensis*	*NT*								C
Northern Brown Bandicoot	*Isoodon macrourus*	*NT*								C
Agile Wallaby	*Notamacropus agilis*			X				X		C
Antilopine Wallaroo	*Macropus antilopinus*					X				
Euro	*Osphranter robustus*			X	X	X		X		
Northern Nailtail Wallaby	*Onychogalea unguifera*	*NT*		X			X		X	C
Short-eared Rock-wallaby	*Petrogale brachyotis*					X				
Little Red Flying-fox	*Pteropus scapulatus*					X				X
Ghost Bat	*Macroderma gigas*	*NT*							X	X

Common Name	Scientific Name	Status	Martin Maud Ck Mine Lease Sep 1994	Martin Maud Ck Mine Lease May 1996	Martin Access Route July 1997	NTG Cutta Cutta Caves (NT PWS 2000)	EMS Maud Creek 2007	ALA Data Search 2019 5km	NTG Fauna Atlas Search 2019 5km	Maud Creek Study Area 2018-19
Dusky Leaf-nosed Bat	*Hipposideros ater*					X	X	X	X	
Orange Diamond-faced Bat	*Rhinonicteris aurantia*	*NT*				X	X	X	X	
Northern Free-tail Bat	*Chaerephon jobensis*						X	X	X	
Common Sheathtail Bat	*Taphozous georgianus*					X	X	X	X	
Arnhem Sheathtail Bat	*Taphozous kapalgensis*						X			
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*						X	X	X	
Northern Bent-wing Bat	*Miniopterus orianae*					X	X	X	X	
Hoary Wattled-bat	*Chalinolobus nigrogriseus*						X	X	X	
Gould's Watted-bat	*Chalinolobus gouldii*						X	X	X	
Little Broad-nosed Bat	*Scotorepens greyii*					X	X	X	X	
Northern Long-eared Bat	*Nyctophilus arnhemensis*						X	X	X	
Pallid Long-eared Bat	*Nyctophilus daedalus*						X	X	X	
Pygmy Long-eared Bat	*Nyctophilus walkeri*						X	X	X	
Large-footed Myotis	*Myotis macropus*						X	X	X	
Northern Cave Bat	*Vespadelus caurinus*					X				
Little Cave Bat	*Vespadelus finlaysoni*					X	X	X	X	
Common Rock Rat	*Zyzomys argurus*					X	X	X	X	
Water Rat	*Hydromys chrysogaster*						X	X	X	X
Forrest's Mouse	*Leggadina forresti*					X				
Western Chestnut Mouse	*Pseudomys nanus*	*NT*					X	X	X	
Black Rat	*Rattus rattus*	*EX*								C
Dingo	*Canis lupus*			X	X		X	X	X	X
Buffalo	*Bubalis bubalus*	*EX*		X	X			X		C
Cattle	*Bos sp*	*EX*			X			X		C
Donkey	*Equus asinus*	*EX*			X	X		X		C
Pig	*Sus scrofa*	*EX*		X				X		X
Feral Cat	*Felis catus*	*EX*		X				X		C
	41	13	0	7	7	17	21	27	22	16

WEED AND PEST ENVIRONMENTAL MANAGEMENT PLAN FOR MAUD CREEK PROJECT AREA

[2022-2025]

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Abbreviations

TABLE 1 ABBREVIATIONS

Acronym	Description
AS	Australian Standards
EPA	Northern Territory Environment Protection Authority
DITT	Department of Industry, Tourism and Trade
EMP	Environmental Management Plan
KPI	Key Performance Indicators
MCPA	Maud Creek Project Area
MMP	Mining Management Plan
NT	Northern Territory
NTMO	NT Mining Operations Pty Ltd
OPR	Operating Performance Report
SOP	Standard Operating Procedure

1. SCOPE

This *Weed and Pest Environmental Management Plan* applies to all personnel and work activities conducted under the direction of NT Mining Operations (NTMO) at the Maud Creek site.

The nature and scope of activities conducted at the Maud Creek Project Area (MCPA) aims to manage weeds and pest associated with Maud Creek Care and Maintenance activities.

2. PURPOSE

NTMO has procedures relating to specific aspects of weed and pest management and this document provides an overarching plan for the coordination and strategic management of effort embedded in those individual plans.

3. CONTEXT

The NTMO policy requires the undertaking of business in a manner that minimises any potential environmental impacts.

Day-to-day management is implemented through the procedures and plans across each of the NTMO operations. This plan aims to integrate and coordinate existing resources into a coordinated approach.

4. AIM

The intention of this management plan is to provide management strategies to reduce the potential loss of native species from weed infestation and pest invasion and the increased risk of uncontrolled wildfires from large infestations of weeds.

5. LEGAL AND OTHER REQUIREMENTS

5.1. Legislation

NTMO and their contactors are obliged to comply with all relevant environmental legislation. There are a range of legislations that relate to weed management in the Northern Territory although weeds are primarily covered by the *Weeds Management Act 2000.* Applicable legislation to weed and pest management in the project area includes:

- *Mining Management Act;*
- *Environment Protection and Biodiversity Conservation Act;*
- *Weeds Management Act;*
- *Biological Control Act;*
- *Territory Parks and Wildlife Conservation Act;* and
- *Soil Conservation and Land Utilisation Act;*

5.2. Guidelines

Relevant guidelines for weed and pest management include:

- Weeds Management Branch, 2018, *Weed management Handbook,* Northern Territory Government.
- Weed Management Branch, *Preventing weed spread is everybody's business*, Northern Territory Government
- Northern Territory Government, 2017, *Gamba Grass*

5.3. NTMO Standard Operating Procedures

NTMO Standard Operating Procedures (SOP) applicable to weed and pest management within the project area includes:

- NTMO ES – SOP 15 Weed Spraying;
- NTMO ES – SOP 30 Weed Control;
- NTMO ES – SOP 31 Incident and Notification Reporting;
- NTMO ES – SOP 32 Pest and Vector Management;
- NTMO ES – SOP 34 Feral Animal Management; and
- NTMO ES – SOP 35 Controlled Burning.

5.4. Approval Conditions

Bushfires NT Permit is required for any burning to be conducted on site.

6. OPERATIONAL STATUS

6.1. Activities

No mining activities are proposed at the MCPA and have remained within a care and maintenance phase. No mining or process activities were undertaken in the reporting period.

Care and maintenance activities that were conducted at the Maud Creek site generally included:

- Weed mapping and treatment;
- Land management (maintaining roads and fire breaks, hazard reduction burning, weed control, sediment and erosion control);
- Environmental monitoring (flora and fauna, surface and groundwater, heritage, sediment and waste rock); and
- Safety and environmental site inspections.

6.2. Risk Management

NTMO have identified activities which may present an environmental risk from weed & pest infiltration, these have been extracted and summarized below.

TABLE 2 RISK ASSESSMENT

Activity	Potential Impact	Residual Risk Level		
		Consequence	Likelihood	Risk
Unstable landform	Weed infestation and erosion of pads	Minor	Unlikely	Very Low
Failure of rehabilitation	Weed infestation of rehabilitated areas	Minor	Possible	Low
Cattle Farming	Weed infestation and erosion.	Minor	Possible	Low

7. OBJECTIVES AND TARGETS

Revising the 2018 weed and pest actions and strategies allows for assessment of successful actions and areas of possible improvement for the 2022-2025 reporting period. NTMO have discussed the proposal to change objectives and targets in the 2020 MMP, the objectives and targets proposed for 2022-2025 are included in the following Table 3. As part of continual improvement, NTMO reviews and assesses performance against these targets. A review and status of environmental performance against these targets are provided to the Department of Industry, Tourism and Trade in annual Mining Management Plan (MMP).

NTMO considers the Specific, Measurable, Achievable, Relevant and Timely (SMART) method when considering annual objectives and targets.

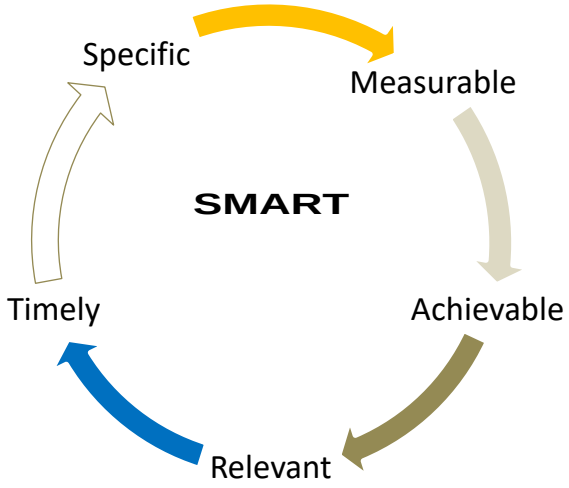

FIGURE 1 SMART METHOD FOR DETERMINING OBJECTIVES

Further detail regarding NTMO objectives and targets for 2022-2025 is provided in Table 3.

8. MEASURING AND MONITORING

Revising the 2018 weed and pest actions and strategies allows for assessment of successful actions and areas of possible improvement for the 2020 reporting period. NTMO have discussed the proposal to change objectives and targets in the 2020 MMP, the objectives and targets proposed for 2022 are included in the following table.

TABLE 3 WEED AND PEST MANAGEMENT STRATEGIES

Specific			Measurable		Achievable	Timely	Relevant	
Strategies (What)	**Actions (How)**	**Explanation (Why)**	**Responsibility (Who)**	**Measurement (Deliverable)**	**Targets**	**Target Dates**	**Key Performance Indicators**	**Non Conformance and Corrective Action**
Monitor occurrences of weed species.	Map weed infestations by density and spatial surveys.	To establish weed locations to target control strategies.	Environmental Officer	Weed Map and details logged in database.	Undertake annual weed mapping (early in dry season when species can be readily identified/late wet season according to NT weed monitoring standards).	Annually Undertake annual weed mapping by June (early in dry season when species can be readily identified / late wet season) based on NT Weed Management Handbook and Advise from DLPE Weed Management Branch	Documented weed maps and database entries.	Review company resources and operating requirements to determine why action wasn't completed. If a new Class A or Weeds of National Significance (WONS) weed species is identified, an incident report will be logged, root cause investigation undertaken and identification of corrective actions for immediate implementation will be undertaken. Identification of any weed species will be managed as part of weed control program at the site. Corrective actions may include: • Implementation of a targeted or broad scale weed control program; • Change in frequency, timing or method of weed control (i.e. chemical or physical control, change in herbicide or slashing, ploughing, grazing etc); • Increased weed mapping; • Review of Weed EMP and/or Weed Control Action Plan; and • Reinforce to personnel appropriate weed management practices.

Specific			Measurable		Achievable	Timely	Relevant	
Strategies (What)	**Actions (How)**	**Explanation (Why)**	**Responsibility (Who)**	**Measurement (Deliverable)**	**Targets**	**Target Dates**	**Key Performance Indicators**	**Non Conformance and Corrective Action**
Monitor occurrences of pest species	Record pest observations	Identify any new or increase in pest numbers.	Environmental Officer	Up to date pest sightings register	Log pest sighting details (e.g. species, location etc) and any complaints in a register following a sighting includes inspection of water ponding areas for mosquito presence if applicable.	Ongoing	Up to date pest sightings register	Re-educate personnel through induction process and site awareness posters to advise Environment team of pest sightings.
Prevent accidental introduction of weeds.	Prohibit off-road driving in vegetated areas and in any off-road areas during the wet season.	To prevent seed transfer of seed by vehicles.	Environmental Officer	New species identified during weed mapping and monitoring	Designated vehicle access utilizing up to date maps of roads and tracks	Annual.	Heavy equipment washed prior to site use	Assess the level of weed migration through the weed mapping process and identify priority control areas as a part of a weed action plan. Discuss with other NTMO staff and contractors through inductions and tool box meetings. Only exploration / environmental staff accessing site.
	Mobile equipment entering site will be inspected to ensure it is clean of high-risk indicators such as caked dirt and residual vegetative materials.	To prevent seed transfer by vehicles.	Environmental Officer	NA	Mobile equipment entering site will be inspected to ensure it is clean of high-risk indicators.	As required.	No new weed species or infested areas identified.	Assess the level of weed migration through the weed mapping process and identify priority control areas as a part of a weed action plan.

Specific			Measurable		Achievable	Timely	Relevant	
Strategies (What)	**Actions (How)**	**Explanation (Why)**	**Responsibility (Who)**	**Measurement (Deliverable)**	**Targets**	**Target Dates**	**Key Performance Indicators**	**Non Conformance and Corrective Action**
Spray weeds	Develop and implement a Weed Control Action Plan.	To minimise adverse impacts to native flora and fauna and to manage weed growth to reduce risk of uncontrolled wildfire impacts.	Environmental Officer	Weed Control Action Plan	Weed Control Action Plan maintained.	Annual review of Weed Control Action Plan. All weed control actions (primarily weed spraying) to be implemented in opportune times during the year.	A documented Weed Control Action Plan.	Weed Control Action Plan will detail the problematic weeds and their respective most appropriate treatment or control including timing.
	Control Gamba as detailed in Weed Control Action Plan	Long term plan to reduce impact and minimise impact of Gamba on location species	Environmental Officer	Weed Control Action Plan. Weed treatment map.	Control Gamba Grass populations onsite	Include treatment for Gamba Grass in Weed Control Action Plan	A documented Weed Control Action Plan.	Weed Control Action Plan will detail the problematic weeds and their respective most appropriate treatment or control including timing
	Include land management (weed monitoring) as part of inspection program to monitor and manage weeds on existing (rehabilitated) WRD.	This will enable action to be implemented if weeds are identified on WRDs	Environmental Officer	Weed mapping	To reduce large infestations (rubberbush)	Annual	Known species of weeds on WRD	Ensure the WRD is implemented into weed mapping activities for the upcoming reporting period.

9. ROLES AND RESPONSIBILITIES

Roles and responsibilities are set out in the following Responsible, Accountable, Consulted and Informed (RACI) matrix.

TABLE 4 ACCOUNTABILITY MATRIX

Task Description	Employees & Contractors	Environmental Officers	Environment & Community Manager	Health & Safety Manager	General Manager	All Managers
Understand and apply all required procedures and systems in regards to weed and pest management	R				I	A
Report any non-compliance with the weed and pest management requirements through the event/incident reporting system	R	C	C		I	A
Sign off on vehicle inspections as required		R	A		I	
Undertake weed mapping, inspections, reviews and monitoring.		R	A			
Maintain fire, weed mapping & weed spraying Logs and Pest sightings register		R	A			
Ensure all employees and contractors are aware of all required procedures and systems for weed and pest management and are provided with all required resources to implement the requirements effectively	I	C	R			A
Ensure all employees and contractors are provided with appropriate clearance approvals with respect to weed inspections prior to giving any native vegetation clearing instructions	I	C	R		A	
Consultation		R	R, A		I	
Ensure all employees and contractors are provided with appropriate weed and pest management related training	I	C	R		A	
Undertake annual review of the Weed and Pest EMP.		R	A		I	

Key:

R	Responsible	Person working on activity
A	Accountable	Person with decision authority, ultimately responsible of failure
C	Consult	Key stakeholder who should be including in decision
I	Inform	Person that needs to know of decision/action/outcome

10. DISCUSSION, ANALYSIS AND REPORTING

10.1. Reporting of results & non-compliances

NTMO has provided performance results against the EMPs and MMP commitments/requirements for the period (2022) within the 2022-2025 MMP. Weed mapping and treatment application for 2022 is also provided in the MMP. Any non-compliance found in this performance report is discussed, analysed with corrective and preventative actions identified.

10.2. Incident Reporting

Where a weed and pest related pollution incident, causes or threatens to cause material[1] or serious[2] environmental harm, on and offsite the Northern Territory DITT will be informed as soon as practicable in accordance with the *Mining Management Act*. As a minimum, NTMO internal policy prescribes reporting within 12 hours and submission of a Section 29 report to DITT within 24 hours. For all environmental incidents offsite the Northern Territory Environment Protection Authority (EPA) will be informed as soon as practicable (and in any case within 24 hours after) as per the *Waste Management and Pollution Control Act 1998*.

Reporting of incidents and non-compliances will be reported in accordance with the NTMO ES – SOP 31 Incidents and Notification Reporting and in the MCPA Operational Performance Report (OPR) and/or Mining Management Plan (MMP).

Any weed and pest related complaints will be recorded in the NTMO INX Inform stakeholder register. Complaints will be discussed within the NTMO Environment Department immediately and as a minimum, the aim is to have a strategy for resolution within a week.

[1] Where material environmental harm is defined as 'environmental harm that is not trivial or negligible in nature, consists of an environmental nuisance of a high impact or on a wide scale, results, or is likely to result, in not more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of not more than $50,000 or the prescribed amount (whichever is greater).

[2] Where serious environmental harm is defined as 'environmental harm that is more serious than material environmental harm and includes environmental harm that is irreversible or otherwise of a high impact or on a wide scale, damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance, results or is likely to result in more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of more than $50,000 or the prescribed amount (whichever is greater).

11. REFERENCES

Northern Territory 'Weed management Handbook" Department of Land Resource Management, 2014. www.nt.gov.au/weeds

Department of Land Resource Management (DLRM) (2018), Northern Territory Weed Management Handbook, Weed Management Branch DLRM, Palmerston.

Department of Land Resource Management (2015) *Katherine Regional Weed Management Plan 2015-2020*. Northern Territory Government

Weed and Seed Inspection

6 Apr 2023 / NTO Environment

Complete

Score	**0%**	Flagged items	**0**	Actions	**0**

Site conducted	Unanswered
Conducted on	6 Apr 2023 14:33 ACST
Prepared for	NTO Environment
Location	

Audit	0%
What is the vehicle or machinery identification?	
What is the vehicle registration?	
What is the NTMO work area?	
Have the wheel arches, rims, mud guards and tracks been checked?	☐
Has the underside of the vehicle or machinery been checked for caked on mud?	☐
Has the engine bay, including the radiator ran, grill and turbo fan been checked?	☐
Has the inside of the cab and underneath floor mats been checked?	☐
There is no mud caked on/in the bucket, blades, drill rods or booms	☐
No seeds are present along the hydraulic hoses	☐
No seeds are present at grease nipple points	☐
No seeds or caked on mud present on platforms or ladders	☐
No seeds or caked on mud present in articulated areas or pinch points	☐
Take photo to document vehicle or machinery type	
Any additional comments I.e. where it arrived from	

KIRKLAND LAKE GOLD

Area/Site: *Maud Creek*
From Date: *01-Feb-2021* **To Date:** *06-Apr-2023*
Standard: *NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle*

Data Point: MCPIT (Disused Maud Creek pit located on Maud creek site); Northing: 225342; Easting: 8401642

Date	FLS Temp	FLS DO	FLS EC (uS/cm)	FLS TDS	FLS Salinity	FLS pH	FLS ORP (mV)	FLS Comments	Acidity as CaCO3 (mg/L)	Alkalinity (Bicarb) as CaCO3 (mg/L)	Aluminium-Dissolved (µg/L)	Aluminium-Total (µg/L)	Arsenic-Dissolved (µg/L)	Arsenic-Total (µg/L)
17-May-21	27.1	81.5	802	520	0.39	8.34	286.3	clear water, green algae, aquatic vegetation, fish, and aquatic insects all present, evidence of cattle and wallabies, salt effloresence present	0	370	0	0	290	290
04-Oct-21	30.7	80.6	870	565.5	0.42	8.2	161.2	clear, fish, birds, veg on banks, brown algae	0	350	0	0	360	330
17-Mar-22	32.7	12.3	762	494	0.37	8.36	204.1	Calm, algae, vegetation, fish.	<5	350	<10	<10	270	250
23-Jul-22	22.3	82.7	793	513.5	0.39	7.99	-24.3	CLEAR, GREEN ALGAE, LOW LEVEL, MANURE ON BANK	<5	380	<10	40	340	360
NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle			5,970			9					5,000		500	
MDL														

** below detectable limit*
*** above detectable limit*

KIRKLAND LAKE GOLD

Area/Site: *Maud Creek*
From Date: *01-Feb-2021* **To Date:** *06-Apr-2023*
Standard: *NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle*

Date	Cadmium-Dissolved (µg/L)	Cadmium-Total (µg/L)	Calcium-Dissolved (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Chloride, Cl (mg/L)	Chromium-Dissolved (µg/L)	Chromium-Total (µg/L)	Cobalt-Dissolved (µg/L)	Cobalt-Total (µg/L)	Copper-Dissolved (µg/L)	Copper-Total (µg/L)	Hardness (mgCaCO3/L)	Hydroxide Alkalinity as CaCO3 (mg/L)	Ionic Balance (%)
17-May-21		0	25	36	17	0	0	0	0	0	0	490	0	2
04-Oct-21			22	59	21	0	0	0	0	0	0	500	0	4
17-Mar-22	<0.1	<0.1	18	46	20	<1	<1	<1	<1	<1	<1	410	<5	-5
23-Jul-22	<0.1	<0.1	18	43	20	1	<1	<1	<1	<1	<1	440	<5	-4
NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle	10					1,000		1,000		1,000				
MDL														

KIRKLAND LAKE GOLD

Area/Site: *Maud Creek*
From Date: *01-Feb-2021* **To Date:** *06-Apr-2023*
Standard: *NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle*

Date	Iron-Dissolved (µg/L)	Iron-Total (µg/L)	Lab Reference Number (-)	Lead-Dissolved (µg/L)	Lead-Total (µg/L)	Magnesium-Dissolved (mg/L)	Manganese-Dissolved (µg/L)	Manganese-Total (µg/L)	Nickel-Dissolved (µg/L)	Nickel-Total (µg/L)	Potassium-Dissolved (mg/L)	Sodium - Dissolved (mg/L)	Sulphate (mg/L)	Total Alkalinity as CaCO3 (mg/L)
17-May-21	0	13	269,708		0	100	0	9	0	0	4.9	30	110	400
04-Oct-21			279,980	0	0	110		0	0	0	5.7	42	120	410
17-Mar-22	<10	<10	291,508	<1	<1	90	<5	6	<1	<1	5	25	97	390
23-Jul-22	20	100	301,722	<1	<1	96	<5	12	1	<1	5	27	98	430
NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle				100					1,000				1,000	
MDL														

KIRKLAND LAKE GOLD

Area/Site: *Maud Creek*
From Date: *01-Feb-2021* **To Date:** *06-Apr-2023*
Standard: *NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle*

Date	Total Suspended Solids (mg/L)	Turbidity (NTU)	Zinc-Dissolved (µg/L)	Zinc-Total (µg/L)
17-May-21	0	0.7	0	3
04-Oct-21	0	0.9	0	0
17-Mar-22	<10	1	1	<1
23-Jul-22	16	0.8	<1	4
NTMO Stock Drinking Water Guidelines (ANZECC, 2000) - Cattle			20,000	
MDL				

CULTURAL HERITAGE ENVIRONMENTAL MANAGEMENT PLAN

FOR

MAUD CREEK PROJECT AREA

[2022-2025]

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ABBREVIATIONS

TABLE 1 ABBREVIATIONS

Acronym	Description
AAPA	Aboriginal Areas Protection Authority
AHC	Australian Heritage Commission
AS	Australian Standards
DEPWS	Department of Environment, Parks and Water Security
DITT	Department of Industry, Tourism and Trade
DLPE	Department of Lands, Planning and Environment
EMP	Environmental Management Plan
MCPA	Maud Creek Project Area
MMP	Mining Management Plan
NT	Northern Territory
RACI	Responsible, Accountable, Consulted and Informed
RNE	Register of the National Estate
SMART	Specific, Measurable, Achievable, Relevant and Timely
SOP	Standard Operating Procedure
NTMO	NT Mining Operations Pty Ltd

1. SCOPE

This *Cultural Heritage Environmental Management Plan* applies to all personnel and work activities conducted under the direction of NT Mining Operations (NTMO) at the Maud Creek Project Area.

2. PURPOSE

The purpose of this plan is to ensure the ongoing protection of known archaeological sites at Maud Creek for all work undertaken by NTMO and contractors.

NTMO has procedures relating to specific aspects of cultural heritage management and this document provides an overarching plan for the coordination and strategic management of effort embedded in those individual plans.

3. CONTEXT

The NTMO policy commits to understand, encourage and promote eco-cultural and cross-cultural awareness, and wherever able, identify and protect sites of environmental or cultural significance.

Day-to-day management is implemented through the procedures and plans across each of the NTMO operations. This plan aims to integrate and coordinate existing resources into a coordinated approach.

4. AIM

The intention of this management plan is to provide advice to protect archaeological sites at the MCPA from NTMO activities.

5. LEGAL AND OTHER REQUIREMENTS

5.1 Legislation

Applicable legislation to cultural heritage management includes:

- *Mining Management Act;*
- *Aboriginal and Torres Strait Island Heritage Protection Act 1984;*
- *Australian Heritage Council Act 2003;*
- *Environment Protection and Biodiversity Conservation Act 1999;*
- *Environment and Heritage Legislation Amendment Act (No 1) 2003;*
- *Environment and Heritage Legislation Amendment Act (No 1) 2006;*
- *Heritage Conservation Act 1991; and*
- *Northern Territory Aboriginal Sacred Sites Act.*

5.2 Guidelines

No relevant guidelines identified.

5.3 NTMO Standard Operating Procedures

NTMO Standard Operating Procedures (SOP) applicable to cultural heritage management within the project area includes:

NTMO ES – SOP14 Archaeological Chance Find;
NTMO ES – SOP28 Ground Disturbance; and
NTMO ES – SOP31 Incident Reporting and Notification.

5.4 Approval Conditions

The following approval conditions may be applicable:

- Permit to Undertake Work under S29 & 39 (Excavate, collect, disturb, destroy) *Heritage Conservation Act 1991*; and
- Aboriginal Areas Protection Authority – Authority Certificate.

AAPA certificate approval conditions are as follows:

- The applicant shall ensure that the conditions of the Certificate are included in any subsequent contract or tender documents for the works or use described herein.
- The applicant shall ensure any agent, contractor or employee is aware of the conditions of this certificate and the obligations of all persons (who enter on, or carry out works or use land on which there is a sacred site) under Part IV of the *Northern Territory Aboriginal Sacred Sites Act 1989*.
- The applicant shall ensure any agent, contractor or employee is aware of the content of section 40(1) of the *Northern Territory Aboriginal sacred Sites Act 1989* which provides that this certificate does not negate the need for consent, approval or permission for the subject works or use of the land which may be required under another statute.

6. OPERATIONAL STATUS

6.1 Activities

The MCPA is in a care and maintenance phase with no mining or processing activities undertaken at this site. Should any activities occur at the project area which would cause ground disturbance, an NTMO Clearing Permit would be required. From this process items with heritage or archaeological significance should be identified.

6.2 Heritage Sites

Previous heritage surveys have been undertaken identifying heritage sites; these include:

- A survey was conducted by NTU (now CDU) Archaeological Service in November 1994 (Guse and Gregory 1994). This is the area where the open pit is located;
- A survey was conducted by Heritage Surveys in July 1996 (Heritage Surveys 1996) to the north of the open pit area;
- A survey was conducted by Quaternary Archaeological Surveys in January 1999 (Guse 1999);
- A survey of the alignment of a then proposed haul road from the Maud Creek mine site to Stuart Highway, conducted by Begnaze Pty Ltd in May 2007 (Begnaze 2007); and
- A survey of a proposed drill pad area within EL25054, conducted by Jung in November 2011 (Jung, 2011).

In accordance with Section 22 of the *NT Aboriginal Sacred Sites Act 1989* an Authority Certificate C2007/072 from the AAPA has been issued on the 8th October 2009 for the Maud Creek Project Area.

Three sacred sites (5369-69, 5369-32 and 5369-27) are known to exist within the vicinity of the project area. Further details of these sites, including a map of their locations, are shown in the AAPA Certificate as attached to the 2022 MMP.

A fourth sacred site is known to be located to the north of NTMO mining lease tenements. The site is described as small egg-shaped quartzite rock which protrudes from the ground about 30cm, and the surrounding area including rocks and hills to the east and north east (easting 224500, northing 8408500). Further details of this site, including a map of its location, is shown in a letter from the AAPA. The location of this site is no longer within NTMO tenements.

7. OBJECTIVES AND TARGETS

The objective of cultural heritage management within the project area is to prevent impacts to cultural heritage sites from activities proposed during the MMP period.

NTMO have one key target to drive and measure performance towards achieving the overarching strategy/objective. This target is described in Table 2. As part of continual improvement, NTMO reviews and assesses performance against these targets. A review and status of environmental performance against these targets are provided to the Department of Primary Industry and Resources in the Mining Management Plan (MMP).

NTMO considers the Specific, Measurable, Achievable, Relevant and Timely (SMART) method when considering annual objectives and targets.

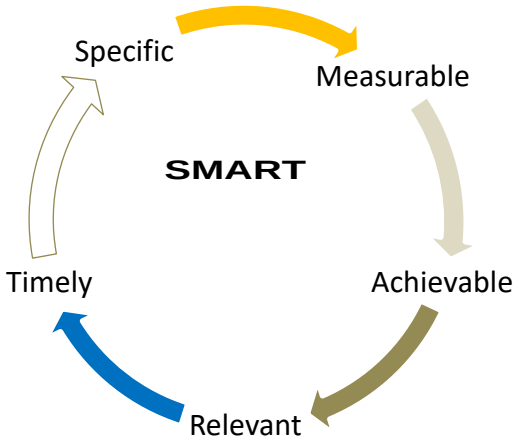


FIGURE 1 SMART METHOD FOR DETERMINING OBJECTIVES

Further detail regarding NTMO objectives and targets for 2022-2025 is provided in Table 2.

8. MEASURING AND MONITORING

NTMO has reviewed the previous reporting periods objectives and targets and have provided a discussion and analysis of results and corrective actions required in the 2020 MMP. The following management strategies table includes the objectives and targets NTMO have proposed for the 2022 period (Table 2).

TABLE 2: CULTURAL HERITAGE MANAGEMENT STRATEGIES

Specific			Measurable		Achievable	Timely	Relevant	
Strategic (Objective)	**Actions (How)**	**Explanation (Why)**	**Responsibility (Who)**	**Measurement (Deliverable)**	**Targets**	**Target Date**	**Key Performance Indicators**	**Non Conformance and Corrective Action**
Avoid unauthorised impact to heritage sites.	Obtain Permit to Clear approval prior to any ground disturbance activities in accordance with NTMO SOPs.	To prevent potential for damage to historical sites of significance.	Environmental Officer	Permit to Clear approvals.	Obtain Permit to Clear approval prior to any ground disturbance activities.	When required Approved Permits to Clear prior to clearing.	Permit to Clear approval obtained No unauthorised / adverse impact to cultural heritage sites.	A review of field and reporting systems and process will be undertaken and actions implemented of outcome.
	Vehicles to remain on designated tracks	To prevent potential destruction to cultural and heritage sites	Environmental Officer	Audits and Inspections. Education occurs during site inductions and verbal communication with external contractors.	By maintaining good access within the site to prevent off road driving	Quarterly during site inspections	No impact to sites of significance from NTMO activities	

9. MANAGEMENT AND MITIGATION

The main control for managing the risk to known heritage sites is through the requirement for personnel to seek approval from the NTMO Environment Department for a Clearing Permit. This process forces a check of the known heritage items in relation to the proposed disturbance area and area walkover prior to the issuing of Clearance Permits.

9.1 Additional controls

In addition to the strategies in Table 2, the following mitigation and management measures will be implemented across the project area in relation to archaeological sites.

Appropriate approvals from the Minister for Heritage will be obtained prior to the disturbance of any archaeological site inside the mine footprint; and

In the event of a chance-find, i.e., in the event that archaeological material is uncovered unexpectedly during exploration, the following will be implemented:

- All work in this area will cease or relocate;
- The area will be demarcated with bunting or bunding and signage;
- The Environmental Manager or Environmental Officer will contact Heritage Conservation Services, Darwin (at DLPE) for advice on how to proceed; and
- Works will not recommence in that area until advice has been received and implemented as required.

9.2 Emergency Preparedness and Response

Activities included in the care and maintenance phase which have the potential to result in a cultural heritage environmental emergency include the following scenarios:

- Wildfire approaching the project area from offsite; and
- Unauthorised disturbance to cultural heritage site

In the event of wildfire a response from the Emergency Response Team (ERT) based at the Cosmo Howley may respond or contact with local fire brigades might be determined as more suitable. In the event of unauthorised disturbance to a cultural heritage site, the Environment team based at the Cosmo Howley will respond with GPS and known heritage surveys to commence investigation. Incident reporting will be triggered and there may be a need to engage an Archaeological expert to assess potential damage. NTMO ES – SOP14 Archaeological Chance Find will then be enacted.

10. ROLES AND RESPONSIBILITIES

Roles and responsibilities are set out in the following Responsible, Accountable, Consulted and Informed (RACI) matrix.

TABLE 3 ACCOUNTABILITY MATRIX

Task Description	Employees & Contractors	Environmental Officers	Environment & Community Manager	Health & Safety Manager	General Manager	All Managers
Understand and apply all required procedures and systems in regards to cultural heritage management	R	I	C			A
Undertake inspections		R	A		I	
Review an issue Clearance Permits with appropriate controls prior to any NTMO disturbance of possible heritage sites.		R	A		I	
Report any non-compliance with the cultural heritage management requirements through the event/incident reporting system.	R	R	A			
Ensure all employees and contractors are aware of all required procedures and systems for cultural heritage management and are provided with all required resources to implement the requirements effectively;	I	R	A	R		
Ensure cultural heritage related complaints are addressed in a timely manner and that corrective actions are implemented as required. Any corrective actions implemented should be included in the annual review of the cultural heritage management EMP	R	R	A		I	I
Undertake annual review of the Cultural Heritage EMP		R	A		I	

Key:

R	Responsible	Person working on activity
A	Accountable	Person with decision authority, ultimately responsible of failure
C	Consult	Key stakeholder who should be including in decision
I	Inform	Person that needs to know of decision/action/outcome

11. DISCUSSION, ANALYSIS AND REPORTING

11.1 Reporting of results and non-compliances

NTMO has provided performance results against the EMPs and MMP commitments/requirements for the 2022 period within the 2022-2025 MMP. Any non-compliance found in this performance report is discussed and analysed, with corrective and preventative actions identified.

11.2 Incident Reporting

Where a heritage (Aboriginal or European) incident causes or threatens to cause damage resulting in material[1] or serious[2] environmental harm, on and offsite, the Northern Territory DITT will be informed as soon as practicable in accordance with the *Mining Management Act*. As a minimum, NTMO internal policy prescribes reporting within 12 hours and submission of a Section 29 report to DITT within 24 hours. For all environmental incidents offsite DENR will be informed as soon as practicable (and in any case within 24 hours after) as per the *Waste Management and Pollution Control Act 1998*.

Additionally, discovery of any European archaeological sites will be reported to the DSLE NT Heritage Council, and cultural archaeological sites will be reported to the NT Heritage Branch and AAPA. Reporting of non-compliances and incidents will be report in accordance with the NTMO-ES – SOP31 Incidents and Notification Reporting.

Any cultural heritage/archaeology related complaints will be recorded in the NTMO INX Inform stakeholder register. Complaints will be discussed within the NTMO Environment Department immediately and as a minimum, the aim is to have a strategy for resolution within a week.

[1] Where material environmental harm is defined as 'environmental harm that is not trivial or negligible in nature, consists of an environmental nuisance of a high impact or on a wide scale, results, or is likely to result, in not more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of not more than $50,000 or the prescribed amount (whichever is greater).

[2] Where serious environmental harm is defined as 'environmental harm that is more serious than material environmental harm and includes environmental harm that is irreversible or otherwise of a high impact or on a wide scale, damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance, results or is likely to result in more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment or results in actual or potential loss or damage to the value of more than $50,000 or the prescribed amount (whichever is greater).

12. REVIEW

The Cultural Heritage EMP will be reviewed and updated no later than annually. A review may occur sooner consequent to a material change in risk, legal requirements, or an incident relevant to cultural heritage management.

13. REFERENCES

Aboriginal Areas Protection Authority – Authority Certificate.

Aboriginal and Torres Strait Island Heritage Protection Act 1984;

Australian Heritage Council Act 2003;

Crassweller, C. 2007. *Archaeological Survey for the Proposed Access Road From Maud Creek Project Area to the Stuart Highway, Katherine, NT.* Begnaze Pty Ltd, dated May 2007.

Environment Protection and Biodiversity Conservation Act 1999;

Environment and Heritage Legislation Amendment Act (No 1) 2003;

Environment and Heritage Legislation Amendment Act (No 1) 2006;

Guse, D. and Gregory, R., 1994. *Archaeological Survey of the Proposed Maud Creek Mining Prospect NT*. NTU Archaeological Service, dated November 1994.

Heritage Conservation Act 1991;

Jung, S. 2011. *Maud Creek Anomaly, Northern Territory Archaeological Survey Report*. Ellengowan Enterprises, dated December 2011.

Mining Management Act;

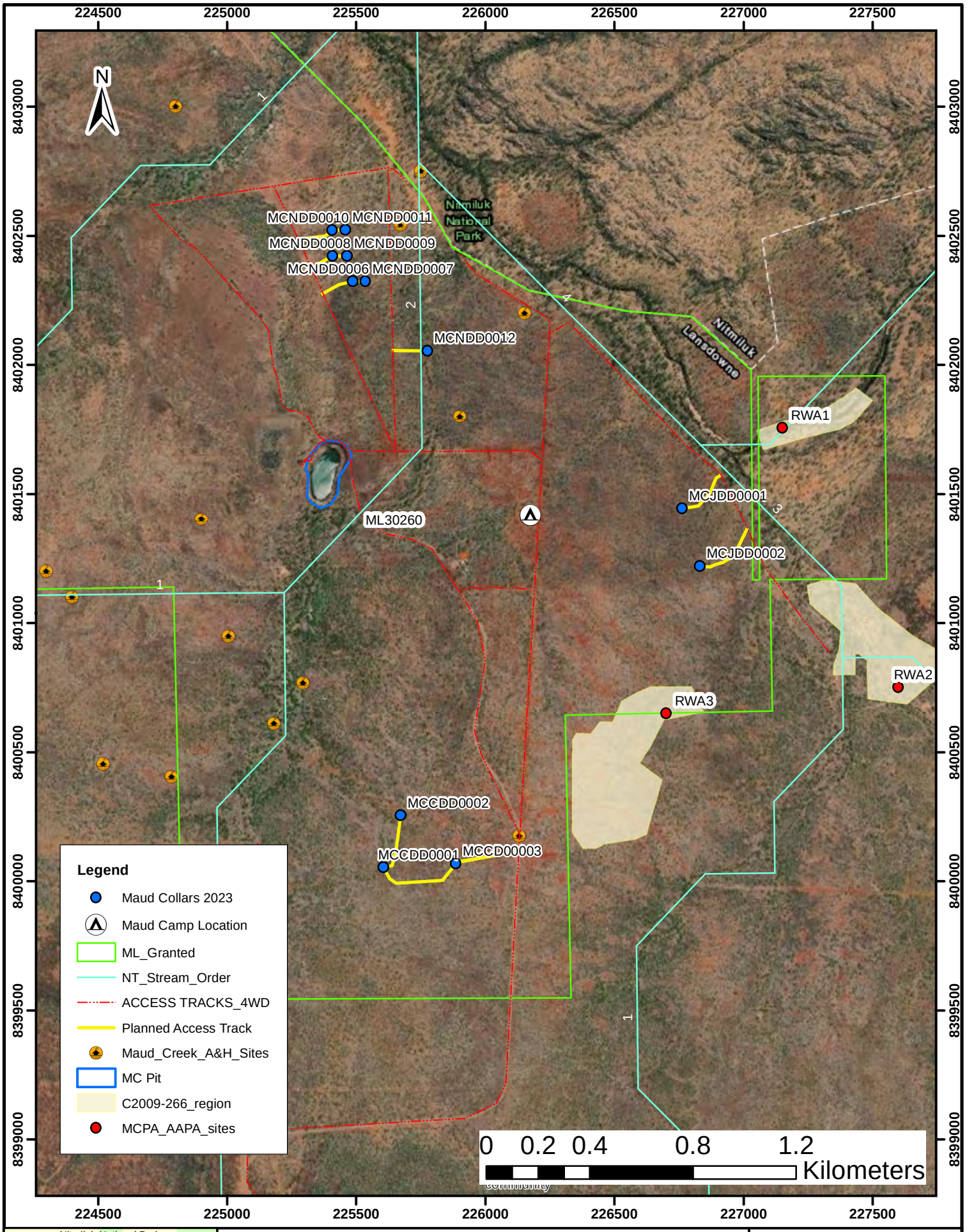
Northern Territory Aboriginal Sacred Sites Act.

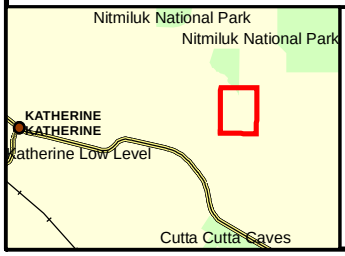
NTMO ES – SOP14 Archaeological Chance Find;

NTMO ES – SOP28 Ground Disturbance;

NTMO ES – SOP31 Incident Reporting and Notification.

Permit to Undertake Work under S29 & 39 (Excavate, collect, disturb, destroy etc) *Heritage Conservation Act 1991*;





NTMO
Maud Creek Proposed Drilling Programme 2023

AGNICO EAGLE

GDA 1994 MGA Zone 53

06 April 2023