APPENDIX M

Flora and Vegetation Assessment

CLIENTS | PEOPLE | PERFORMANCE

Vista Gold Australia Pty Ltd

Mt Todd Gold Project

Flora and Vegetation Assessment

May 2013

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Photo Index

Appendices

This Mt Todd Gold Project Flora and Vegetation Assessment ("Report"):

1. *has been prepared by GHD Pty Ltd which provides the Report –for Vista Gold Australia Pty Ltd (Vista Gold);*
2. *has been prepared as part of the Draft Environmental Impact Statement and should be read in conjunction with the full report;*
3. *must not be copied to, used by, or relied on by any person other than Vista Gold Australia Pty Ltd and other Australian Regulatory Authorities (NT EPA and SEWPAC) without the prior written consent of GHD;*
4. *may only be used for the purpose of assessing the impacts of the Project on Flora and Vegetation (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Vista Gold *arising from or in connection with this Report.*

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- *were limited to those specifically detailed in section 3.4 of this Report;*

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"). GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the assumptions of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of the report, after which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

Summary and Conclusions

Vista Gold Australia Pty Ltd (Vista Gold) is proposing to re-establish and operate the Mt Todd Gold Mine, located approximately 55km north-west of Katherine, Northern Territory (NT).

The Mt Todd Gold Project (Project) will include the mining of gold from the existing Mt Todd Gold Mine - Batman Pit (previously mined and now in care and maintenance).

This report satisfies the requirements of the Draft Environmental Impact Statement (Draft EIS) Guidelines relating to flora and vegetation on the mine site area in the mining leases.

Review of existing information on the flora and vegetation of the Mt Todd area and subsequent field survey and analysis allowed for the following conclusions:

- Existing vegetation mapping by Wilson and Clark (1990) is largely adequate and accurate in describing the vegetation of the mineral leases. This Project modified the boundaries between the vegetation types using high quality, recent imagery and captures the footprint of disturbance from mining activity that occurred after Wilson and Clark's mapping;
- GHD's survey identified 238 taxa, of which 71 were not previously recorded on DLRM (formally the Department of Natural Resources Environment the Arts and Sport (NRETAS)) or Wilson and Clark (1990) lists. The total number of species known from the area is now 962. GHD identified 12 introduced taxa on the mineral leases;
- Approximately 888.5 ha (16.44%) of the natural vegetation in the mineral leases was removed in the period from 1990 – current. A further 110.14 ha was modified;
- Five of the vegetation types present in the mineral lease were impacted by land clearing from the Batman Mine activities (1990 – current). The maximum area removed of any one type was 525.99 ha (*Eucalyptus tectifica* woodland). This equates to a 25.18 % reduction of this vegetation type in the mineral leases. This vegetation type best matches the regional vegetation type mapped at a 1:250,000 scale of *E. tectifica, E. latifolia, E. tintinnans, E. spp*. woodland. The removal of 525.99 ha of this vegetation type represents an approximate reduction of 0.3% of this vegetation type within the bioregion;
- The footprint of the Mt Todd Gold Project will cover 1267.13 ha. Of this:
  - 608.72 ha is remnant native vegetation;
  - 28.83 ha is degraded (or modified) vegetation; and
  - 629.58 ha is cleared land.
- The 608.72 ha (with numbers rounded) of remnant native vegetation that will be impacted by the project consists of five vegetation types. These include:
  - 96.08 ha of *E. bigalerita*, *E. spp.* open forest (Vegetation type 2)
  - 57.10 ha of *E. tintinnans*, *E. spp*., *Erythrophleum chlorostachys* woodland (Vegetation type 4)
  - 83.17 ha of *E. tintinnans*, *E. dichromophloia* woodland (Vegetation type 6)
  - 294.83 ha of *E. tectifica* woodland (Vegetation type 9)

- 77.53 ha of *Corymbia latifolia, E. bigalerita* open-woodland with areas of grassland (Vegetation type 11).

- The maximum area to be removed by the Project of any one type is 294.83 ha (vegetation type 9: *E. tectifica* woodland) which equates to a loss of 14.11% of the 1990 extent in the mineral leases. The proposed clearing would result in a cumulative loss of 39.29 % of this vegetation type in the mineral leases based on the pre-1990 extent. This vegetation type best matches the regional vegetation type mapped at a 1:250,000 scale of *E. tectifica, E. latifolia, E. tintinnans, E. spp*. woodland. The removal of 294.83 ha of this vegetation type represents an approximate reduction of 0.29 % of this vegetation type within the bioregion. The proposed clearing would result in a cumulative loss of approximately 0.60 % of this vegetation type in the bioregion based on the pre-1990 extent;
- All the area's vegetation types are well represented at the local scale in the mineral leases and the broader vegetation polygons are well represented in the region;
- The *E. tintinnans w*oodlands of the mineral leases (vegetation types 4 and 6), is known to provide habitat for a significant breeding population of the Gouldian finch. Within the mining lease 6.07% of vegetation type 4 and 8.70% of vegetation type 6 were removed as a result of mining activity during the period 1990 – current by and respectively. The proposed clearing for the Mt Todd Gold Project will lead to a removal of a further 3.75% and 11.50 % respectively based on the pre-1990 extent i.e. cumulative loss of 9.82% and 20.20%;
- The structural and floristic characteristics of the areas of *E. tintinnans* woodland to be cleared are not significantly different from those of the vegetation type in other areas of the mineral leases;
- A known population of the threatened *U. singeriana* was not in evidence at the time of the surveys. Habitat similar to that at the *U. singeriana* locations was found on the mineral leases. No specimens were located; and
- Three flora species declared as weeds under the *Weeds Management Act 2001* were observed in the mineral leases during GHD surveys. Flora records of the area contain eight declared weed species (including these three). Areas away from the disturbed mine site exhibited limited weed infestation.

Abbreviations

EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EPBC	*Environment Protection and Biodiversity Conservation Act* 1999
MNES	Matters of National Environmental Significance
NVIS	National Vegetation Information System
PMST	Protected Matters Search Tool
NRETAS	Department of Natural Resources, Environment, The Arts and Sport (now NT EPA, Department of Land Resource Management and Department of Lands, Planning and Environment)
RNE	Register of the National Estate
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Populations and Communities
SOCS	Sites of Conservation Significance
subsp.	subspecies
TPWC	*Territory Parks and Wildlife Conservation Act* 2006
var.	variety

1 Introduction

1.1 Project Background

Vista Gold Australia Pty Ltd (Vista Gold) proposes to re-establish and operate the Mt Todd Gold Mine, located approximately 55km north-west of Katherine, Northern Territory (NT) (Figure 1-1). The mine and associated infrastructure are known as the Mt Todd Gold Project (Project).

The Project will include the mining of gold from the existing Mt Todd Gold Mine - Batman Pit (previously mined and now in care and maintenance).

The then Northern Territory Minister for Natural Resources, Environment and Heritage determined that a draft Environmental Impact Statement (EIS) is required for the Project. The EPA (formally the Department of Natural Resources, Environment, The Arts and Sport (NRETAS)) subsequently issued '*Guidelines for the Preparation of an Environmental Impact Statement – Mt Todd Gold Project Katherine Region NT, Vista Gold Australia Pty Ltd, September 2011*'. The EIS is being assessed under an accredited arrangement between the Commonwealth and Northern Territory governments.

The scope of this vegetation and flora assessment is limited to the proposed mine site and mineral lease area.

The specific clauses of the EIS Guidelines relating to flora and vegetation addressed in this report are detailed below. The flora and vegetation analyses use a combination of background research and field survey.

The EIS Guidelines related to flora assessment and vegetation mapping include:

- Section 6.3 Biodiversity; Clauses:
  - Conduct baseline survey of areas of native vegetation that Vista Gold proposes to clear in the proposal;
  - Conduct targeted threatened species survey. Identify flora species of national conservation significance present, or potentially present within the project area, and which may be affected by the project;
  - Provide a map of the vegetation communities within the Project and surrounding areas at an appropriate scale. Identify areas containing significant vegetation communities, including creek lines with associated riparian vegetation or rainforest;
  - Identify areas requiring clearing of native vegetation for the Project, including potential for edge (degradation) effects and any disturbance to drainage lines. Present alternative configurations where available to minimise clearing requirements. Detail habitat types within areas to be cleared with focus on significant habitats and habitats supporting species of conservation significance;
  - Identify presence and potential presence within the Project area of weeds; and
  - Identify habitats and species of conservation significance and species listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

- Section 7.6 Biodiversity; Information Requirements:
  - Detail the extent of clearing required during construction and operation and indicate on a map;
  - Discuss impacts on species, communities and habitats of local, regional or national significance including sensitivity of species to disturbance;
  - Discuss impacts such as loss of vegetation, reduction in species abundance, introduction and increase in abundance of pest plants and animals, edge effects, reduced conditions for favourable plant growth, impacts on habitat corridors, habitat loss and fragmentation;
  - The ability of identified stands of vegetation to withstand any increased pressure resulting from the project (e.g. increase in dust, light, noise, vibration, traffic and fire) and measures proposed to mitigate impacts;
  - Identify and discuss environmental risks associated with the proposed land clearing. Discuss proposed clearing with regard to issues raised and recommendations contained within the NT Land Clearing Guidelines (NRETAS 2009);
  - Discuss ways in which impacts on species, communities and habitats can be minimised (e.g. timing of works, minimising disturbance catchment); and
  - Demonstrate that appropriate flora survey methodology has been employed to define species present on the project site.

1.2 Previous Disturbance and Mining History

The study area has been a centre of human activity and associated disturbance of habitats for possibly as long as 35,000 years or more (Earth Sea Heritage Surveys 2013).

The Mt Todd area is the location of numerous Aboriginal archaeological sites, including a large quarry site occupying the *E. tintinnans* woodland habitat (and Gouldian finch breeding area) to the west and south of the Batman Pit. Significant numbers of camp sites, other quarry sites and artefact scatters have been recorded from the area (Earth Sea Heritage Surveys 2013). There has been no assessment of the nature or area of disturbance attributable to Aboriginal activities or the nature of implications for habitats in the area today.

European exploration led to additional disturbance of the site (Earth Sea Heritage Surveys 2013). The Overland Telegraph Line transected the site in 1872, and was soon followed by mining for gold. From then until the 1980s the study area was the site for intermittent mining for gold, tin and wolfram. Much of the disturbance was overgrown by the early 1990s. Wilson and Clark (1990) estimated 24 ha of disturbed land.

The Project area was again mined for gold in the 1990s, however predicted capacity was not achieved due to inadequacies in the crushing circuit reducing recoveries of gold. Cyanide soluble copper minerals led to high reagent consumption, further hindering efforts to reach designed production levels. Operating costs at the mine were above those predicted in the feasibility study, and the spot price of gold deteriorated. The mine closed and was placed in care and maintenance in 1997.

General Gold formed a joint venture with Multiplex Resources and Pegasus Gold to own, operate and explore the mine in 1999. Operations ceased in July 2000, with administrators appointed. Mining infrastructure such as tailing dams, waste rock dumps and remains of

processing facilities remain on site. The mine has again been in care and maintenance for the past 10 years.

1.3 Objectives of the Assessment

GHD was engaged by Vista Gold to undertake flora and vegetation assessment of the proposed mine site and lease areas. The main objective of the assessment is to meet the flora reporting requirements outlined in the EIS guidelines for the Project. This has been achieved by:

- Reviewing the previous vegetation mapping to confirm the types and distribution of vegetation present in the study area;
- Identifying the main vegetation types, their structure and floristic composition;
- Providing an inventory of the flora of the site;
- Examining the habitat, floristics and structure of the vegetation present in the study area;
- Undertaking targeted surveys for threatened flora species that may be present on the mine site;
- Identifying and record any habitat or vegetation associations that are potentially sensitive to disturbance, or important to economies or life cycles of native flora or fauna;
- Identifying introduced flora (weeds) present in the area and mapping significant infestations; and
- Assessing the significance of the study area's vegetation in local and regional contexts.

1.4 Project Description

Mining and associated operations are proposed to occur on mine leases MLN 1070, MLN 1071 and MLN 1127 covering 5,363 ha (Figure 1-3). A small portion of EL29886 will be inundated due to raising of the raw water dam and a Special Purpose Licence will be applied for to accommodate this.

Mining will be by conventional open-pit truck and shovel methods, using large haul trucks, hydraulic shovels and front-end loaders to load and transport material to the crusher. There will be ore stockpiles, waste dumps and tailings storage facilities. Extracted ore, up to 17.8 million tonnes per annum (Mtpa), will be transported to an ore processing plant where it will be crushed, pre-treated and subjected to carbon in leach (CIL) leaching followed by adsorption, desorption and recovery leading to gold dore (unrefined gold). Gold dore will be trucked for onward secure shipment to a refinery.

The Project, based on current known data, will have a life of around 19 years inclusive of construction, operations and closure. Construction is anticipated to commence in the first quarter of 2014 and take two years, including 6 months pre-production. The mine is scheduled to operate for a further 13 years. Closure and rehabilitation of the mine is expected to take four years.

The key elements of the Project at Mt Todd (Figure 1-2) include:

Mining and Mining Infrastructure

- extension of the existing Batman Pit from its current depth of 114m to approximately 588m (RL -400m) and surface area of 40 hectares (ha) to approximately 137ha;
- expansion of the existing waste rock dump (WRD) from a height of 24m above ground level to approximately 350m above ground level (RL 470m), and a footprint of 70ha to approximately 217ha. The dump currently contains 16Mt of waste rock and the expansion will provide total capacity of up to 510 Mt;
- construction of a Run of Mine (ROM) pad and ore stockpile;
- construction of an Ammonium Nitrate and Fuel Oil (ANFO) Facility;
- construction of heavy and light vehicle workshop and administration offices, and facilities comprising wash down area, tyre change facility, lube storage facility etc; and
- construction of haul roads and access roads.

Process Plant and Associated Facilities

- Ore Processing Plant capable of processing approximately 50,000 tonnes per day of ore;
- processing and / or reclamation of the existing low grade ore (LGO) stockpile and scats stockpile, and construction and processing of new LGO stockpile with a footprint of approximately 47ha;
- raising the existing tailings storage facility (TSF1) from 16m to approximately 34m above ground level;
- construction of a new TSF2, approximately 300ha in area and up to 60m high (RL 175m);
- diversion of Horseshoe Creek and Stow Creek adjacent to TSF2 to provide flood protection;
- rehabilitation of the existing heap leach pad (HLP), if residual HLP material is not processed through the new plant;
- chemical and reagent storage and handling facility; and
- process plant workshops, administration offices, control room etc.

Other Infrastructure

- gas fired Power Station, including re-routing of the existing gas pipeline;
- anaerobic treatment wetlands, approximately 10ha in area;
- a 2m high raising of the raw water dam (RWD) and an increase in the area of inundation;
- construction of saddle dams at the RWD and TSF1;
- construction of three coffer dams at Retention Pond 1 (RP1) and deepening of RP1;
- water treatment plant;
- potential re-alignment of access roads;
- site wide drainage, sediment traps; and
- modification to existing fuel storage and distribution facility.

1.5 Study Area

The Mt Todd Gold mine site is located approximately 55km northwest of Katherine and 250km south of Darwin, NT, Australia (Figure 1-2). Mining and associated operations will occur on MLN 1070, MLN 1071 and MLN 1127 covering approximately 5,400 ha (Figure 1-3) (and a small portion to the north of MLN 1071). Vista Gold also controls exploration leases EL 25576, EL 25668, EL 25669 and EL 25670 covering 117,632 ha.

The topographical feature named Mt Todd is within the mineral leases. The mine site is accessed via Jatbula Road (restricted mine access road), approximately 10km west of the Stuart Highway (the main highway between Darwin and Adelaide).

The following definitions apply for the purposes of this assessment:

- Mine site – areas of previous or proposed disturbance within the mineral leases (and a small portion to the north of MLN 1071); and
- Mineral leases – the broader area defined by MLN 1070, MLN 1071 and MLN 1127.

Surrounding land uses immediately adjacent to the mine site include:

- North – Horseshoe Tin Field (historic);
- East – Nitmiluk National Park;
- South – Edith River and Edith Falls Road; and
- West – A portion of the Yinberrie Hills (the hills and adjacent habitats including the entire mineral leases is identified on the NT Government list of Sites of Conservation Significance).

The Mt Todd mine site contains a variety of landforms including hills and strike ridges on persistent Burrell Creek Greywacke, sandstone and siltstone, and undulating hills on lower Proterozoic sediments (Burrell Creek Formation). There are major creek and river drainage floors and a regular distribution of levees, back plains and depressions, dissected by erosion gullies (Tetra Tech 2011).

Soils vary from sandy and loamy red and yellow earths to lateritic and yellow podsolic soils on the gently undulating land, often over compact clay sub-soils. Heavier textured grey soils are found on the floodplains and levees of the Daly River system while stony and skeletal soils occur in the rocky outcrops (Tetra Tech 2011).

Key environmental elements of the site and its surrounds include:

- Mt Todd which lies in the Project area and has an elevation of 230m;
- The Yinberrie Hills located to the west of Batman Pit. The Yinberrie Hills was listed in the Interim List for the Register of National Estate until 2007 when the register was closed. They are not listed under the *Environment Protection and Biodiversity Conservation Act 1999*. The Yinberrie Hills is one of a few known documented major breeding sites for the nationally endangered Gouldian finch and is listed on the NT Government list of Sites of Conservation Significance; and
- Edith River immediately south of the mine site. The mine site is downstream of Edith Falls.

1.6 Climate

The climate in the Katherine Region is characterised by hot, humid wet seasons lasting from November to March followed by a hot dry season from April to October. Transition periods occur between the wet and dry seasons. A majority of rain falls in the wet season.

The Katherine region has an average rainfall of approximately 1,100 mm. This is highly seasonal ranging from 0.4mm in June to 269.4 mm in January (BoM 2011).

Temperatures have average maxima of 35.9°C and minima of 20.3°C. Relative humidity at 0900 hours ranges from 83% in February to 52% in August, with respective monthly values of 60% and 24% at 15:00 hours. Daily evaporation rates range from 7.9mm in October to 4.9 mm in June, with an annual average of 6.2 mm.

1.7 Geology and Soils

The Mt Todd Gold Mine is located in the Early Proterozoic Pine Creek Geosyncline (PCG), comprising meta-sediments, granitoids, basic intrusives, acid and intermediate volcanic rocks. The deposits are similar to other gold deposits of the PCG. Gold deposits in the PCG are classified as orogenic gold deposits in the subdivision of thermal aureole gold style (Tetra Tech 2011).

The Batman Deposit shares some characteristics with intrusion-related gold systems, especially in terms of the association of gold with bismuth and reduced ore mineralogies. This makes the deposit unique in the PCG. The mineralisation in the Batman Deposit is directly related to the intensity of the north-south trending quartz sulphide veining. The lithological units impact on the orientation and intensity of mineralisation (Tetra Tech 2011).

Sulphide minerals associated with the gold mineralisation are pyrite, pyrrhotite, and lesser amounts of chalcopyrite, bismuthinite, and arsenopyrite. Galena and sphalerite are present but appear to be post-gold mineralisation and are related to calcite veining, bedding, and the east-west trending faults and joints (Tetra Tech 2011).

1.8 Bioregion

Bioregions are geographical areas with broadly similar landform, geology and biodiversity characteristics.

The Mine Site occurs in the Pine Creek Bioregion, just north-east of the Daly Basin Bioregion boundary. The Pine Creek Bioregion:

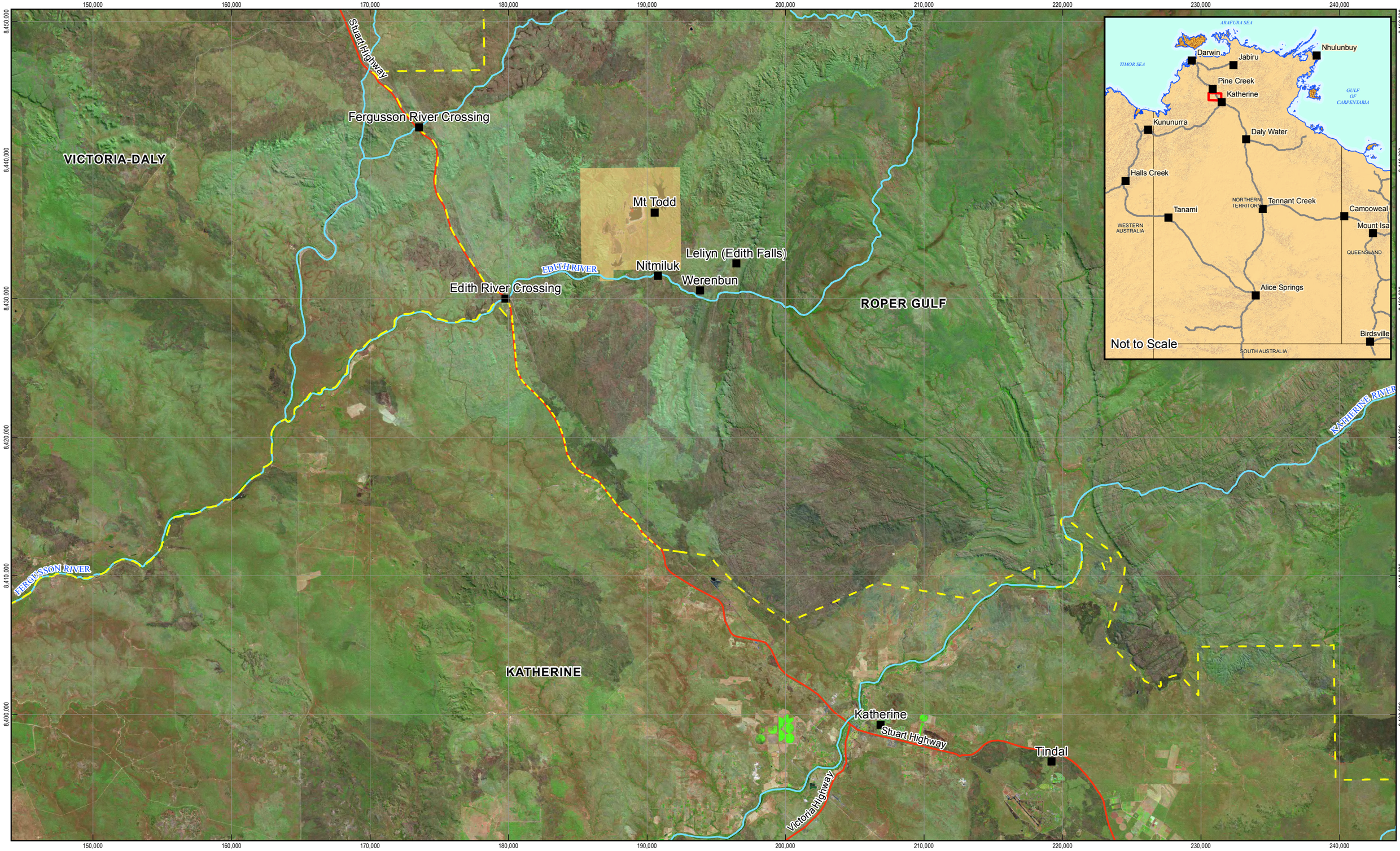
- Encompasses an area of 28,456km^2 comprising 2.12% of the total NT land area;
- Is characterised by foothill environments below and to the west of the western Arnhem Land sandstone massif;
- Supports the highly mineraliferous Pine Creek Geosyncline, comprising archaean granite and gneiss overlain by Palaeoprotozoic sediments;

- Has the dominant vegetation types of tall open eucalypt forests, typically dominated by Darwin Woollybutt (*Eucalyptus miniata*) and Darwin Stringybark (*E. tetrodonta*), with smaller patches of monsoon rainforest, *Melaleuca spp.* woodlands, riparian vegetation and tussock grasslands; and
- Has a tropical monsoonal climate with 90% of the rainfall occurring between the months of November and April. The average rainfall varies from 1,000mm inland to 1,600mm in coastal areas.

1.9 The Yinberrie Hills

The Mt Todd Mine Site is located in the south-western end of the Yinberrie Hills a key area in northern Australia for the Gouldian finch (*Erythrura gouldiae*). The following information (obtained from http://www.nt.gov.au/nreta/environment/conservation/pdf/30_yinberrie.pdf on 21 July 2011) provides a general description of the area:

- The Yinberrie Hills are characterised by rolling hills, rising from the extensive plains to the north, east and south and are distinct from the Arnhem Land escarpment to the east and north-east. The hills encompass an area of 1,025km^2 and are dominated by sandstone hills and rises;
- The hills are dominated by grassy open woodland, but provide habitat attributes that are scarce in the broader landscape including an understorey of perennial native grasses, retention of water in small rocky pools throughout the dry season and smooth-barked eucalypts with hollows. The hills support grassy eucalypt woodlands with a mixed over-storey of snappy or salmon gums (including *Eucalyptus tintinnans*), *E. tectifica*, *Corymbia confertiflora* and an understorey dominated by tall annual spear-grasses;
- Around 8% of the Yinberrie Hills area is managed as a conservation reserve (Nitmiluk National Park). Significant tourism and mining occur and/or have occurred in the area;
- Ecological values include persistent use of the area by relatively large numbers of the endangered Gouldian finch (i.e. 150 to 250 finches; O'Malley 2006), and the presence of the largest known breeding population of the species. The hills provide permanent water and foraging habitat during the dry season. Hollow-bearing trees provide nesting habitat during the late wet season and early dry season. The lowlands adjacent to the hills support perennial grasses used by finches for feeding during the wet season. Other threatened species that inhabit the Hills include Australian bustard, crested shrike-tit (northern), partridge pigeon, northern quoll, Mertens' water monitor and yellow-spotted monitor; and
- The main management consideration in the Yinberrie Hills is a fire regime typified by large-scale, late dry-season fires that encourage fire-tolerant plant species and reduce the availability of grass seed favoured by the Gouldian finch during the wet season. Other management concerns include large numbers of feral pigs and cattle.



1:250,000 (at A3)

0 2.5 5 7.5 10

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

LEGEND

- Place Names
- LGA Boundaries
- Major Roads
- Mt Todd Mineral Leases
- Rivers

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	1
Date	27 May 2013

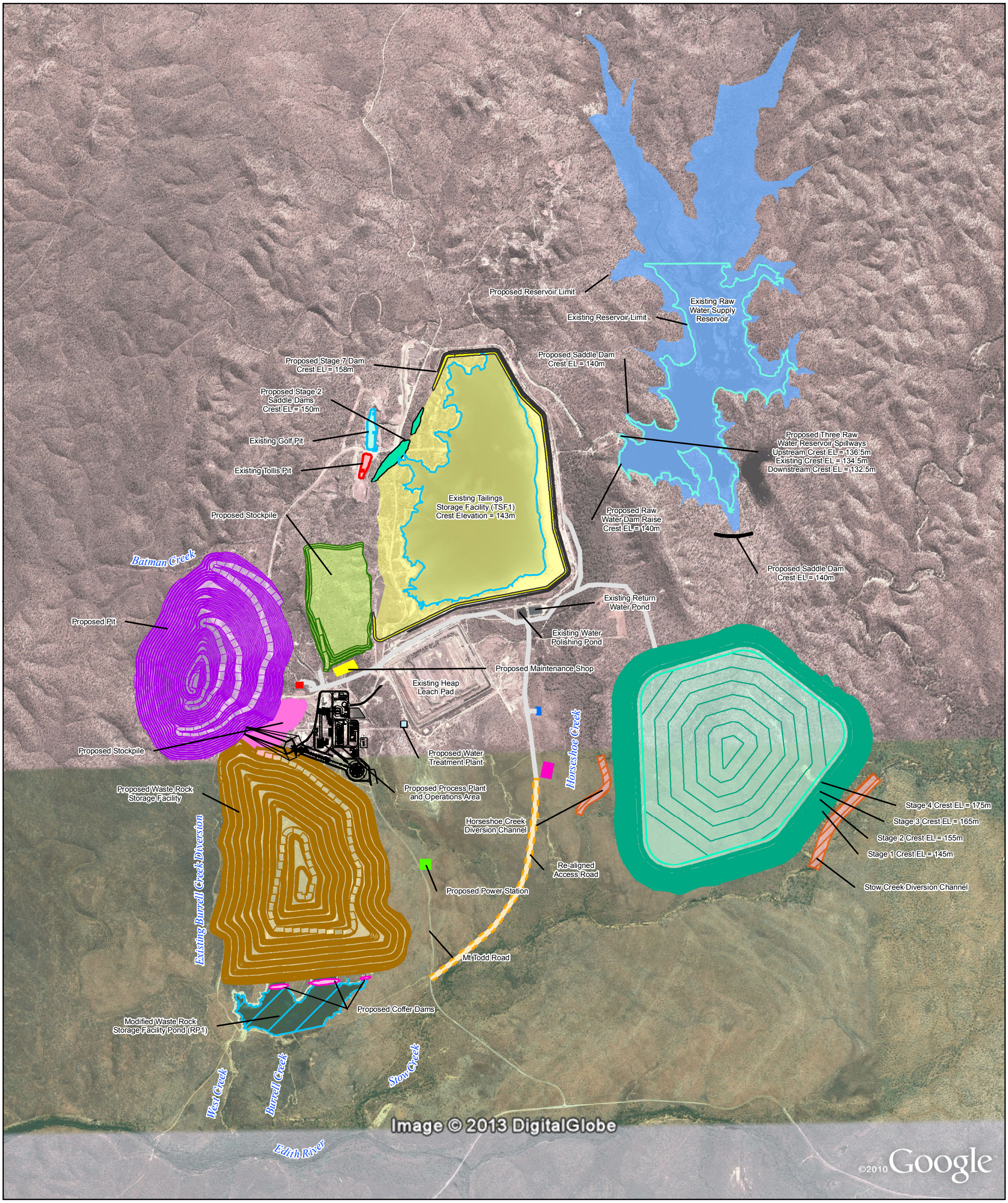
Project Location

Figure 1-1

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_201.mxd

Data source: NRETAS - Drainage (2011). Vista Gold - Mt Todd Mining Leases (2011). Geoscience Australia - Landsat Imagery (2007), Place Names, LGA Boundaries, States, Major Roads (2008). ESRI - SRTM (2009). Created by: CM

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au



LEGEND

- Process Plant
- Golf Pit
- Tollis Pit
- Fuel Bays
- Proposed Maintenance Shop
- Power Plant
- Proposed Haul Road
- Re-aligned Access Road
- Coffer Dams
- ANFO Facility
- Explosives Magazine
- Diversion Channels
- Raw Water Dam Existing Water Body
- Indicative Raw Water Dam
- TSF1 Contours
- TSF1 Existing Water Body
- Proposed Saddle Dam
- TSF1
- Low Grade Ore Stockpile Contours
- Low Grade Ore Stockpile
- TSF2 Impounded Surface Area (Year 12)
- TSF2 Contours (Year 12)
- TSF2 Footprint (Year 12)
- Water Treatment Plant
- Batman Pit Contours (Year 12)
- Proposed Saddle Dam (Raw Water Dam)
- Retention Pond 1
- Batman Pit Footprint (Year 12)
- Waste Rock Dump Contours (Year 10)
- Waste Rock Dump Footprint (Year 10)
- Stockpile

0 0.25 0.5 0.75 1
Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

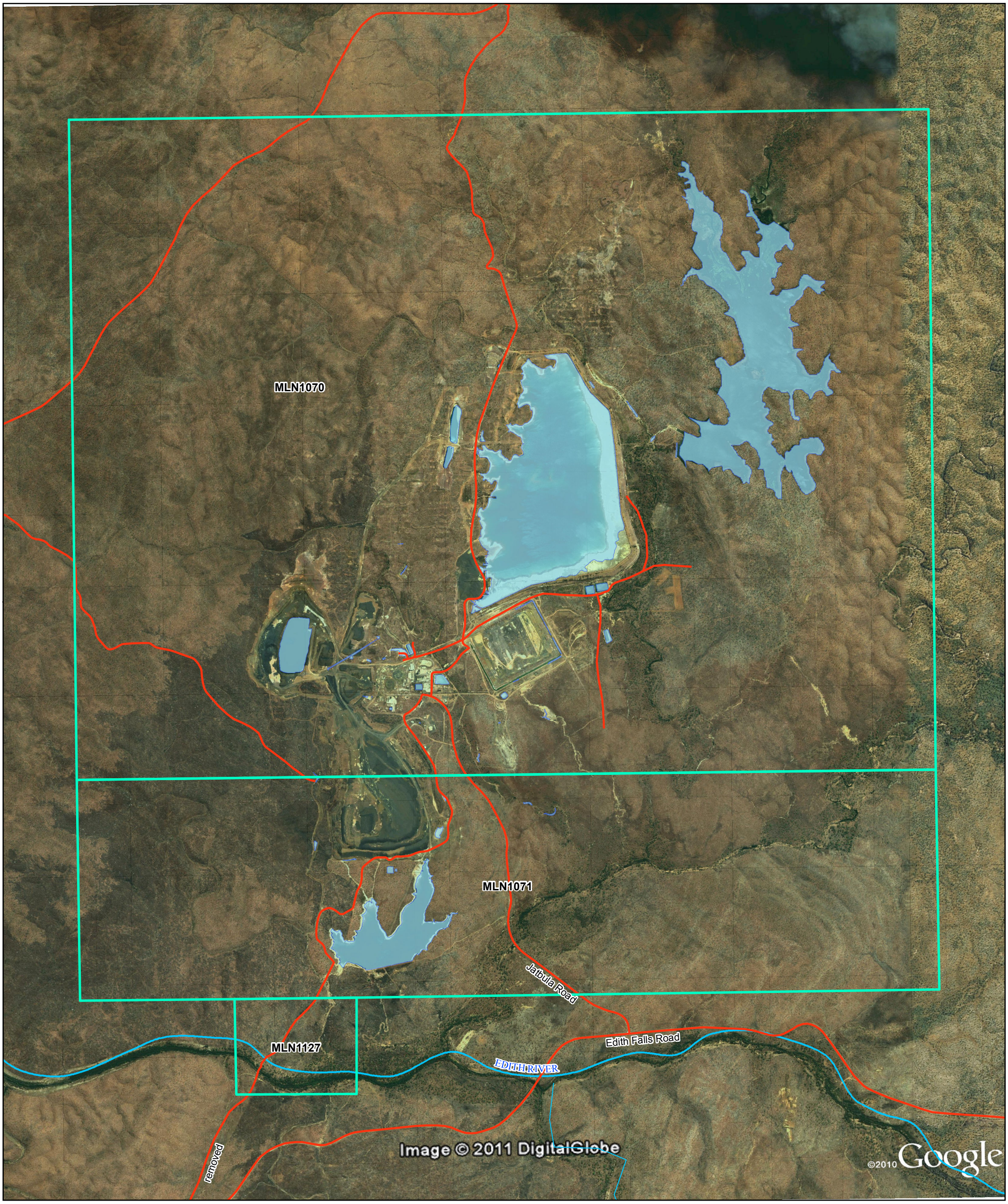
Job Number	43-21801
Revision	1
Date	11 Jun 2013

Mt Todd General Facilities Arrangement Figure 1-2

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_206.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Tetra Tech - Process Plant, Golf Pit, Tollis Pit, Fuel Bays, Proposed Maintenance Shop, Power Plant, Realigned Roads, Proposed Haul Road, Coffer Dams, ANFO Facility, Explosives, Diversion Channels, Raw Water Dam Existing Water Body, Indicative Raw Water Dam, TSF1 Contours, TSF1 Existing Water Body, Proposed Saddle Dam, TSF1, Low Grade Ore Stockpile Contours, Low Grade Ore Stockpile, TSF2 Impounded Surface Area, TSF2 Contours, TSF2 Footprint, Water Treatment Plant, Batman Pit Contours, Proposed Saddle Dam (Raw Water Dam), Retention Pond 1, Batman Pit Footprint, Waste Rock Dump Contours, Waste Rock Dump Footprint, Stockpile (2013). Google Earth Pro - Imagery (Date extracted: 17/05/2013). GHD - Creek Names (2011). Created by: CM



LEGEND

Mineral Lease Boundary

Water bodies

Access Roads

Waterways

0 0.5 1 1.5

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number 43-21801
Revision 1
Date 27 May 2013

Mineral Leases

Figure 1-3

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_207.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: NRETAS - Waterways (2011). Vista Gold - Mineral Leases, Water Bodies (2011). Google Earth Pro - Imagery (Date Extracted: 28/03/2011). GHD - Access Roads (2011). Created by: CM

2 Legislation

The following section provides information with regard to specific biodiversity legislation and policy relevant to the Project. This information is not intended to provide an exhaustive list of legislative requirements but rather a summary of the key requirements. The information is based upon GHD's understanding of the legislation and policy, and GHD consultants' experience with their implementation. There is a possibility that regulatory authorities may interpret and/or implement the legislation and policy differently.

2.1 Commonwealth Environmental Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) promotes the conservation of biodiversity by providing protection for threatened species, threatened ecological communities, migratory and marine species and other protected matters.

A referral was submitted under the EPBC Act and it has been determined that the Project may impact significantly on two matters of national environmental significance (MNES) i.e. listed threatened species and communities (sections 18 and 18A) and listed migratory species (sections 20 and 20A) and triggers assessment under the act.

2.2 Territory Environmental Legislation

2.2.1 Territory Parks and Wildlife Conservation Act 2006

The extended title of the *Territory Parks and Wildlife Conservation Act 2006* (TPWC Act) is:

"An Act to make provision for and in relation to the establishment of Territory Parks and other Parks and Reserves and the study, protection, conservation and sustainable utilisation of wildlife".

The TPWC Act has provisions for parks and reserves, animals and plants (including wildlife and protected wildlife).

The TPWC Act defines wildlife as that being in a park, reserve, sanctuary, wilderness zone or area of essential habitat, or is a vertebrate that is indigenous to Australia (other than fish), or is specifically prescribed as being protected by the TPWC Regulations. Protected wildlife is protected wildlife whether or not the property with the wildlife is vested in the Territory.

The TPWC Act prohibits the intentional killing of any terrestrial or marine vertebrate (with the exception of fish).

All threatened species are classed as protected wildlife. The TPWC Act precludes the taking of and interference with protected species of wildlife. The Act includes "Principles of Management". These require that a threatened species be managed in a manner that "maintains or increases their population or the extent of their distribution at or to a sustainable level". Threatened species are defined under the Territory's Wildlife regulations as being species that are 'extinct", "critically endangered", "endangered" and "vulnerable".

2.2.2 Planning Act 2009

The *Planning Act 2009* defines "development" as an activity that involves carrying out works on land, including clearing of native vegetation. "Works" is defined as any activity on land other than mining or agriculture, resulting in a physical change to the land or a part of the land.

The planning scheme requires native vegetation to be cleared in accordance with the Land Clearing Guidelines 2010 (NRETAS 2010). This document contains guidelines for clearing, including the submission of a property management plan by the applicant. The Planning Act does not apply to mining. As the proposed works are being undertaken as part of a mining operation the Land Clearing Guidelines do not apply to this project. However one of the requirements stipulated in the Environmental Impact Statement (EIS) guidelines is to discuss proposed clearing with regard to issues raised and recommendations contained within the Clearing Guidelines. These guidelines refer to a number of issues not limited to flora and vegetation and are not treated in their entirety within this report.

2.2.3 Weeds Management Act 2001

The *Weeds Management Act 2001* (WM Act) is in place to prevent the spread of weeds and to ensure that the management of weeds is an integral component of land management. This is to be conducted in accordance with the Northern Territory Weeds Management Strategy 1996-2005 (NRETA, date unknown) or any other strategy adopted to control weeds in the Territory.

Noxious Weeds

Declared noxious weeds in the NT are plants proclaimed under the WM Act. The legislation requires that reasonable attempts be made to control or eradicate these species. Categories of noxious weeds include the following:

- Schedule Class A/C Weeds: These plants do not occur in the NT but pose a significant threat if they invade, or if present, pose a serious threat. Reasonable effort must be made to eradicate these weeds.
- Schedule Class B/C Weeds: These weeds often occur widely in the NT. They are capable of spreading further and should be prevented from doing so. Continuing control measures are required to prevent their spread. Reasonable attempts must be made to contain the growth and prevent the movement of these plants.
- Schedule Class C Weeds: This category includes plants that pose an unacceptable risk of spreading in the Territory or to other parts of Australia if they were to be sold or traded in the NT and are a serious threat to another State or Territory of Australia. All schedule Class A and B weeds are considered to be Class C weeds.

The manager of the mine site has responsibilities to manage weeds in accordance with this act.

3 Methods

Tasks involved in the preparation of this flora and vegetation assessment included:

- Literature review of existing studies for the mine site, leases and broader area;
- Database searches to identify threatened flora and ecological communities, and essential habitats recorded or predicted to occur in the area;
- Flora field surveys including habitat assessment;
- Targeted threatened species survey;
- Compilation of flora species lists for the study area;
- Preparation of descriptions of the vegetation communities occurring in the study area;
- Assessment of the conservation significance of vegetation communities with reference to threatened ecological communities listed under the TPWC Act and EPBC Act;
- Assessment of the likelihood of occurrence of threatened flora species listed under the TPWC Act and/or the EPBC Act; and
- Impact assessment for threatened flora and vegetation clearance.

3.1 Database Searches

A desktop literature and database review was undertaken to identify threatened flora species and ecological communities listed under the TPWC Act and the EPBC Act that may occur in the area. Results of the searches provide an overview of previous records, known distributional ranges and habitats types, and are used to provide an overview of species known or predicted to occur in the study area. The following databases were reviewed prior to conducting the field investigations:

- The NT Herbarium Database (including 10km buffer); and
- Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) Protected Matters Search Tool for relevant MNES predicted to occur in the locality (including 10km radius buffer).

3.2 Review of Previous Vegetation Mapping

3.2.1 Local Scale Vegetation

Wilson and Clark (1990) mapped the vegetation of the study area at a scale of 1:50,000 in preparation for environmental assessment and planning prior to approval of the Batman Gold Mine. It is unknown what the resolution of Wilson and Clark's base imagery was however their report claims their 1:50,000 scale map was based on stereoscopic examination of 1:25,000 scale, colour, aerial photographs flown in 1981. The extent of the area mapped at 1:50,000 scale is that covered by the mineral leases and a small area to the north and beyond the western boundary of the mineral leases.

Wilson and Clark's (1990) vegetation mapping was overlayed on current aerial photography to quantify the area of each vegetation type disturbed during the existing mine's development and operation. The areas of existing disturbance were delineated and shown as polygons on the vegetation map. This was used as the preliminary vegetation map for the Project area. It was also used for field verification of the extent of disturbance and assessment of possible changes in the distributions of vegetation types.

A focus of the Wilson and Clark 1990 mapping was the *E. tintinnans* woodlands of the area, because they were recognised significant breeding habitat of the Gouldian finch (*Erythrura gouldiae*) (O'Malley 2006). These woodlands were mapped in and around the proposed mine site development footprint, and the densities of *E. tintinnans* with stems >10 cm diameter at breast height (DBH) determined.

Relative losses of each vegetation type at the local scale have been expressed in the context of vegetation types mapped at the 1:50,000 scale (Wilson and Clark 1990) including amendments based on field verification within the mineral leases.

3.2.2 Regional Scale Vegetation

Bioregional vegetation mapping at a 1:1,000,000 scale was determined to be unsuitable for the purpose of comparing vegetation losses at the local and regional scales, because at this coarse scale vegetation has only been mapped into major vegetation groups such as Tropical Eucalyptus woodland, Eucalyptus open forest etc.; making it somewhat meaningless to evaluate the impacts associated with vegetation removal.

Wilson and Clark mapped the vegetation of the area from Katherine to Pine Creek at a scale of 1:250,000 as part of a project investigating Gouldian Finch habitat in the Yinberrie Hills region (Wilson and Clark 1990). This vegetation map, which includes the mineral leases, covers an area of approximately 682,824 hectares, It extends from just south of the study area to approximately 100 km north Figure 4-3.

The limited coverage of the 1:50,000 Wilson and Clarke mapping inhibits the evaluation of vegetation losses at the regional scale as a result of mining activities. In order to quantify losses at a regional scale the 1:50,000 scale vegetation types have been equated to the most similar vegetation types mapped at 1:250,000 scale. This has been done at the expense of some detail due to the inherent problems with trying to compare vegetation mapped at different scales (i.e. detail visible on a figure mapped at the 1:50,000 scale may not be visible at the broader scale of 1:250,000 scale) however due to the lack of mapping covering the regional area at 1:50,000 scale, this is the most meaningful comparison.

Relative losses of each vegetation type at the regional scale have been expressed in the context of vegetation types mapped at the 1:250,000 scale (Wilson and Clark 1990) within:

- The mapped area between Pine Creek and Katherine; and
- The Yinberrie Hills Site of Conservation Significance (SOCS).

The 1:250,000 scale map has been updated with the current disturbance footprint of the mine site as interpreted from aerial imagery and confirmed in the field.

3.3 Field Assessment

Two GHD botanists conducted dry and wet season surveys of the mineral leases in accordance with NT Guidelines and Field Methodology for Vegetation Survey and Sampling (Brocklehurst *et al.* 2007). An additional field survey was also conducted during the 2012 dry season following adjustments to the proposed project footprint. The field surveys consisted of:

- A five day field assessment between 9 and 13 May 2011;
- A four day field assessment between 24 and 27 February 2012; and
- A two day field assessment between 16 and 17 October 2012.

The field assessments were to:

- Verify the existing vegetation mapping (Wilson and Clark 1990), with particular attention to delineating the extent of existing disturbance and the boundaries between vegetation types;
- Collect data from 20 m x 20m quadrats, including an inventory of all flora species present and the structural characteristics of the vegetation;
- Record the structural characteristics and flora species present in *E. tintinnans* woodlands proposed for development as compared to those that will remain undeveloped;
- Determine the presence of individuals or suitable habitat for threatened flora (in particular *Utricularia singeriana*); and
- Map the distribution of introduced flora across the lease areas.

A Trimble Nomad GPS unit was used to record spatial locations.

Identifications of flora were made in the field using CSIRO (2006), Maslin (2001) and Sharp and Simon (2001). Other resources used were Brock (2001), Smith (2002), Wheeler (1992) and Woinarski *et al.* (2007). The nomenclature applied is consistent with the Northern Territory Flora Checklist (Short *et al.* 2011) and the Mabberley update to family nomenclature adopted by the NT Herbarium. Species of flora were identified to species level where possible. The absence of certain diagnostic features (this is a function of the seasonal cycles of flora species) prevented identification of some plants to species level. They were identified to genus level. Samples of taxa where positive identification was not possible were sent to the NT Herbarium for verification/identification.

3.3.1 Verification of Existing Vegetation Mapping

Dry Season Surveys (2011/2012)

Eight different vegetation types as mapped by Wilson and Clark (1990) occur in the Mt Todd mine site, five of which are in areas proposed to be impacted by mining. The dominant species in each of the three strata (upper, mid and ground), the total canopy cover for each stratum and incidental species encountered were recorded at randomly chosen locations in each of the five vegetation types to be impacted by the Project. This was in accordance with the NRETAS 'road notes' method (Brocklehurst *et al* 2007: p29), a method used to substantiate existing vegetation mapping (Brocklehurst *et al.* 2007). The locations are shown in Figure 3-1. Boundaries between the vegetation types were verified through visual observation in the field and refined using field observation and interpretation of aerial imagery.

Wet Season Survey

The method for data collection was consistent with the *Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping* (Brocklehurst *et al.* 2007). Data was collected from 20 m x 20 m quadrats with two replicates in each of the eight vegetation types of the mineral leases. Vascular plants were identified to species level, using nomenclature based on Short *et al.* (2011).

In addition to these data, heights and projected foliage cover were estimated for each species. Average height and percentage cover were recorded for each vegetation layer based on Brocklehurst et al. (2007). A site photograph was taken from the north-east corner of each quadrat.

Other data collected at each site included:

- Total percentage cover in each of three strata (upper, mid and ground);
- Dominant species in each strata;
- Surface soil type;
- Ground cover;
- Rock size presence;
- Evidence of past disturbance (e.g. fire, grazing, feral animals or weeds); and
- Basal area of trees per hectare (using a Bitterlich Gauge).

Records of incidental flora species and notes on the vegetation surrounding the quadrats were taken. The vegetation map generated by GHD based on Wilson and Clark (1990) was verified or adjusted where appropriate. An updated vegetation map was then produced for the site (Figure 4-1)

Classification of Vegetation Types

A classification of vegetation 'types' was based on groups of characteristic species (Brocklehurst *et al.* 2007). Structural attributes were assigned to the groups to produce a structural vegetation type classification.

Vegetation types were described according to the National Vegetation Information System, Level V: Association (NVIS; Brocklehurst *et al.* 2007). The NVIS description identifies the following characteristics of a community:

- Landform/lithology;
- Dominant stratum (layer);
- Dominant species;
- Average height and height range;
- Cover (percentage canopy cover for upper layers (trees and shrubs) and percentage cover for ground vegetation); and
- Growth form (e.g. tree, shrub, tussock grass, Brocklehurst *et al.* 2007).

Mapping of vegetation communities was undertaken at 1:50 000 scale (GDA94) by visually interpreting an aerial image with a 0.7m resolution.

3.3.2 Characterisation of *Eucalyptus tintinnans* woodlands

E. tintinnans woodlands occurring in the mineral leases were stratified into three development situations:

- Currently disturbed woodlands from past mining activities;
- Not previously disturbed but within the proposed development footprint; and
- Not previously disturbed and outside proposed development footprint.

Nineteen 10m x 10m quadrats were placed in *E. tintinnans* woodlands (Figure 3-1). Floristic and structural data was collected in the 19 quadrats in Vegetation Types 4 (VT 4) (9 quadrats) and 6 (VT 6) (10 quadrats). The following data were collected in each quadrat:

- Flora species presence, height and relative cover;
- Percentage rock cover by size (<5cm; 6-15cm; 16-30cm; 31+cm or bare ground);
- Number of stems >10cm diameter at breast height (DBH);
- Slope and aspect; and
- Number of stems counted in basal sweeps using a Basal Area Factor (BAF) Gauge (or Bitterlich wedge) (this measures stems in and outside the quadrat).

An agglomerative hierarchical classification using the Bray and Curtis association measure was used to classify the 19 flora plots using the intrinsic variables describing tree species presence, abundance and diversity.

3.3.3 Grass Species Trends across the Mineral Leases

Wet season quadrat floristic and cover/abundance data were analysed to determine groupings based on dominant flora species. These were analysed by a PATN analysis using the Bray Curtis classification. Grass trend data was generated and supplemented with qualitative and quantitative field observations.

3.3.4 Threatened Flora

One population of the threatened flora species (*Utricularia singeriana)* is known to occur within a relatively short distance of the mine. This species is listed as Vulnerable under the TPWC Act. This site was located by GHD botanists, and searches conducted for individual *U. singeriana* by site traverse. No individuals were recorded during these searches, however the species is cryptic and can only be identified when in flower (usually for a short period between March and May). Therefore not finding this species does not discount its presence at the site. Notes were taken relating to the soil, landscape position, topography, flora species present and the structure of the vegetation at that location. This provided a characterisation of the vegetation in which *U. singeriana* occurs (or has been known to occur).

During the dry season surveys, areas in the mineral leases with similar characteristics were mapped as potential *U. singeriana* habitat. Targeted searches for *U. singeriana* were undertaken in areas of suitable habitat during targeted wet season surveys. These surveys involved two botanists systematically traversing areas of potentially suitable habitat in the mineral leases.

3.3.5 Introduced Flora

The locations of introduced flora species were marked on a handheld GPS unit, including species present, and whether weed species occurred as individuals or in patches of various sizes.

3.4 Limitations and Assumptions

3.4.1 Mapping

The extent of vegetation communities was mapped by interpretation of aerial imagery. The scope of the assessment did not allow for detailed validation of the spatial or attribute accuracy of the vegetation and weed maps. A subset of the study area was ground-truthed during the field survey.

3.4.2 Flowering Seasonality

Field surveys were conducted during the dry season (6-13 May 2011 and 16-17 October 2012) and wet season (24-27 February 2012). This is generally considered to be an optimal time for conducting complete flora surveys in Northern Australia. It is likely that some flora species may not have been recorded due to a lack of flowering material, or they may have been present as seed in the soil seed bank.

3.4.3 General

Mapping of quadrat locations using handheld GPS was accurate to c. ± 10 metres. Locations of the quadrats may be 'inaccurate' to this extent.

Yinberrie Hills
Proposed Reservoir Limit
Existing Reservoir Limit
Existing Raw Water Supply Reservoir
Proposed Stage 7 Dam Crest EL = 158m
Proposed Stage 2 Saddle Dams Crest EL = 150m
Proposed Saddle Dam Crest EL = 140m
Saddle Dam
Saddle Dam
Existing Golf Pit
Existing Tollis Pit
Proposed Three Raw Water Reservoir Spillways Upstream Crest EL = 136.5m Existing Crest EL = 134.5m Downstream Crest EL = 132.5m
Existing Tailings Storage Facility (TSF1) Crest Elevation = 143m
Proposed Stockpile
Proposed Raw Water Dam Raise Crest EL = 140m
Proposed Saddle Dam Crest EL = 140m
Proposed Pit
Batman Creek
Horseshoe Creek
Existing Return Water Pond
Existing Water Polishing Pond
Proposed Maintenance Shop
Existing Heap Leach Pad
Water Treatment Plant
Proposed Water Treatment Plant
West Creek
Proposed Stockpile
Proposed Process Plant and Operations Area
Proposed Waste Rock Storage Facility
Creek Diversion Channel
Creek Diversion Channel
Stage 4 Crest EL = 175m
Stage 3 Crest EL = 165m
Stage 2 Crest EL = 155m
Stage 1 Crest EL = 145m
Horseshoe Creek Diversion Channel
Stow Creek Diversion Channel
Proposed Power Station
Re-aligned Access Road
Stow Creek
Mt Todd Road
Proposed Coffer Dams
Modified Waste Rock Storage Facility Pond (RP1)
Burrell Creek
Edith River
West Creek
Image © 2013 DigitalGlobe
©2010 Google

LEGEND

Dry Season 2012
- Check Site
- Wet Season
  - Check Site
  - Quadrat
- Dry Season
  - Check Site
  - Quadrat
- Batman Pit
  - Year -1
- Waste Rock Dump
  - Year 1
- Year 1
- Year 2
- Year 3
- Ultimate Boundary
- Year 5
- Process Plant
- Golf Pit
- Tollis Pit
- Fuel Bays
- Proposed Maintenance Shop
- Power Plant
- Proposed Haul Road
- Re-aligned Access Road
- Coffer Dams
- ANFO Facility
- Explosives Magazine
- Diversion Channels
- Raw Water Dam Existing Water Body
- Indicative Raw Water Dam
- TSF1 Existing Water Body
- Proposed Saddle Dam
- TSF1 Contours
- TSF1
- Low Grade Ore Stockpile Contours
- Low Grade Ore Stockpile
- TSF2 Impounded Surface Area (Year 12)
- TSF2 Contours (Year 12)
- TSF2 Footprint (Year 12)
- Water Treatment Plant
- Proposed Saddle Dam (Raw Water Dam)
- Retention Pond 1
- Stockpile
- Mt Todd Mineral Leases

0 0.25 0.5 0.75 1
Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number 43-21801
Revision 2
Date 30 May 2013

Sampled Areas (Quadrat and Check Sites)

Figure 3-1

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Tetra Tech - Process Plant, Golf Pit, Tollis Pit, Fuel Bays, Proposed Maintenance Shop, Power Plant, Realigned Roads, Proposed Haul Road, Coffer Dams, ANFO Facility, Explosives, Diversion Channels, Raw Water Dam Existing Water Body, Indicative Raw Water Dam, TSF1 Contours, TSF1 Existing Water Body, Proposed Saddle Dam, TSF1, Low Grade Ore Stockpile Contours, Low Grade Ore Stockpile, TSF2 Impounded Surface Area, TSF2 Contours, TSF2 Footprint, Water Treatment Plant, Batman Pit Contours, Proposed Saddle Dam (Raw Water Dam), Retention Pond 1, Batman Pit Footprint, Waste Rock Dump Contours, Waste Rock Dump Footprint, Stockpile (2013). Google Earth Pro - Imagery (Date extracted: 17/05/2013). GHD - Creek Names (2011). Created by: CM

4 Results

4.1 Vegetation Communities

Nationally and regionally significant vegetation communities

No nationally significant vegetation communities were recorded during this study.

Pine Creek Bioregion has a large proportion of its area (12,133km^2 or 42.64%) conserved in reserves, most notably Kakadu, Nitmiluk, Litchfield and Mary River National Parks (NRETA 2005).

There is one known threatened ecological community that occurs in the Pine Creek Bioregion: Arnhem Plateau Sandstone Shrubland Complex Ecological Community. This community is listed on the EPBC Act as endangered. This vegetation community was not recorded within the mineral leases.

Rainforest, riparian and wetland areas have been identified as being at risk within the Pine Creek Bioregion due to impacts of feral animals, weeds, livestock or fire (NRETA 2005). Riparian areas are present along Edith River and Stow Creek in the south of the leases.

4.1.1 Verification of Existing Vegetation Mapping

Local Scale Vegetation

Eight vegetation types were identified on the minesite at the scale of 1:50,000 by Wilson and Clark (1990) (Table 4-1).

Table 4-1 Areas of Vegetation Types within the MLNs

Vegetation Type	Area (ha)
1	15.01
2	367.09
4	1690.48
4 (degraded)	60.38
6	734.33
6 (degraded)	49.77
9	1385.13
10	42.39
11	171.11
16	58.33
Cleared	888.54
Total	5462.56

These vegetation types were adjusted based on field observation and interpretation of good quality, recent aerial imagery. The names of the vegetation communities are provided as per Wilson and Clark (1990). Five vegetation types occur in areas to be disturbed by the proposed development (Figure 4-1). These are indicated by an asterisk (*) in the descriptions in Section 4.2. The distribution of the communities is likely to be determined by local and regional environmental gradients in geology, substrate, water availability and disturbance regimes.

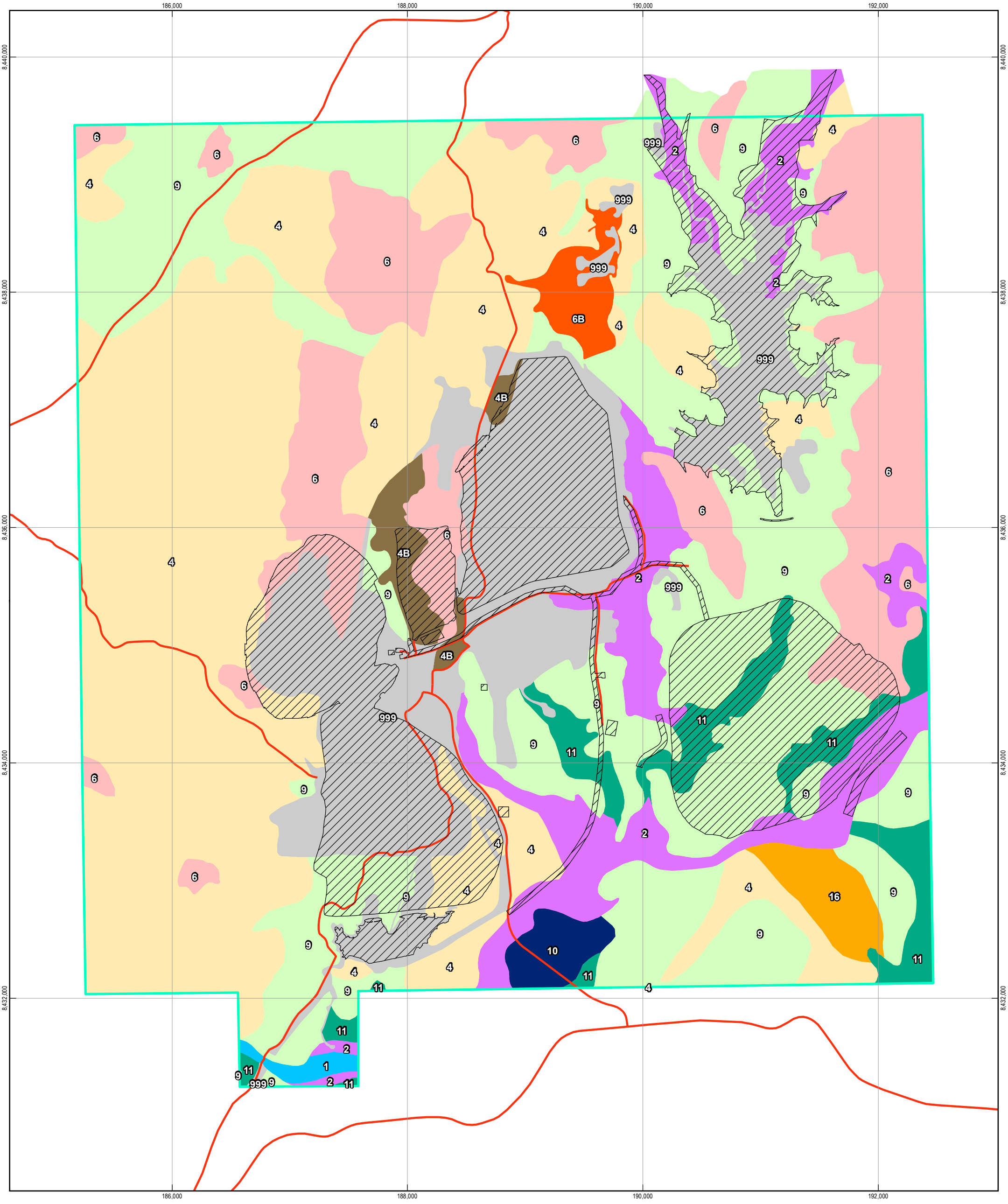
Wilson and Clark's (1990) vegetation mapping exercise was undertaken prior to mining activity associated with the Batman Mine (circa 1990s). Various areas of mining activity predate the Batman Pit disturbance. These were identified in the field. The Batman Mine and mining activity predating that, disturbed 888.54ha of the 5416.03ha of the mineral leases (plus an additional 110.14ha of degraded vegetation). Wilson and Clark (1990) identified only small patches of "man-made clearings" around what is now the raw water dam north east of the existing tailings dam.

The dominant species reported by Wilson and Clark (1990) were consistently observed in the mapped vegetation types throughout the mineral leases with the exception of a mapped patch of vegetation type 9 in the north western corner of the mineral lease. This patch of approximately 220 hectares was confirmed in the field to be vegetation type 4.

The mapped boundaries between vegetation types recorded by Wilson and Clark (1990) were found to be largely adequate with small adjustments made to vegetation boundaries using field observations and the interpretation of a high quality aerial image. The adjustments were not a significant variation from the Wilson and Clark map. The high quality, recent aerial image covers 3952.02ha of the 5403.47ha of the mineral leases (73.12%) and has a resolution of 0.7m.

Regional Scale Vegetation

The 1:250,000 scale vegetation mapping with the area of the Yinberrie Hills SOCS is shown in Figure 4-2 and Figure 4-3. This mapping shows 10 vegetation types in the mine site, nine of which are in existing or proposed development footprints. The vegetation type not under the current or proposed development footprints is marked with an asterisk (*). The area of each regional vegetation type within the MLNs is provided in Table 4-2.



LEGEND

- Roads
- Mount Todd Mineral Lease Extents
- Proposed Future Vegetation Disturbance

Vegetation Community

- 1 *Melaleuca* forest, with bare areas
- 2 *E. bigalerita Eucalyptus* spp. open-forest
- 4 *E. tintinnans Eucalyptus* spp.*Erythrophleum chlorostachys* woodland
- 4B *E. tintinnans Eucalyptus* spp.*Erythrophleum chlorostachys* woodland (Disturbed)
- 6 *E. tintinnans C dichromophloia* woodland
- 6B *E. tintinnans C dichromophloia* woodland (Disturbed)
- 9 *E. tectifica* woodland
- 10 *E. tectifica C. confertiflora* woodland
- 11 *E. latifolia E. bigalerita* open-woodland with areas of grassland
- 16 *E. tectifica* woodland \ *E. tintinnans Eucalyptus* spp. *Erythrophleum chlorostachys* woodland
- 999 Disturbance

1:30,000 (at A3)

0 250 500 750 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number 43-21801
Revision 1
Date 27 May 2013

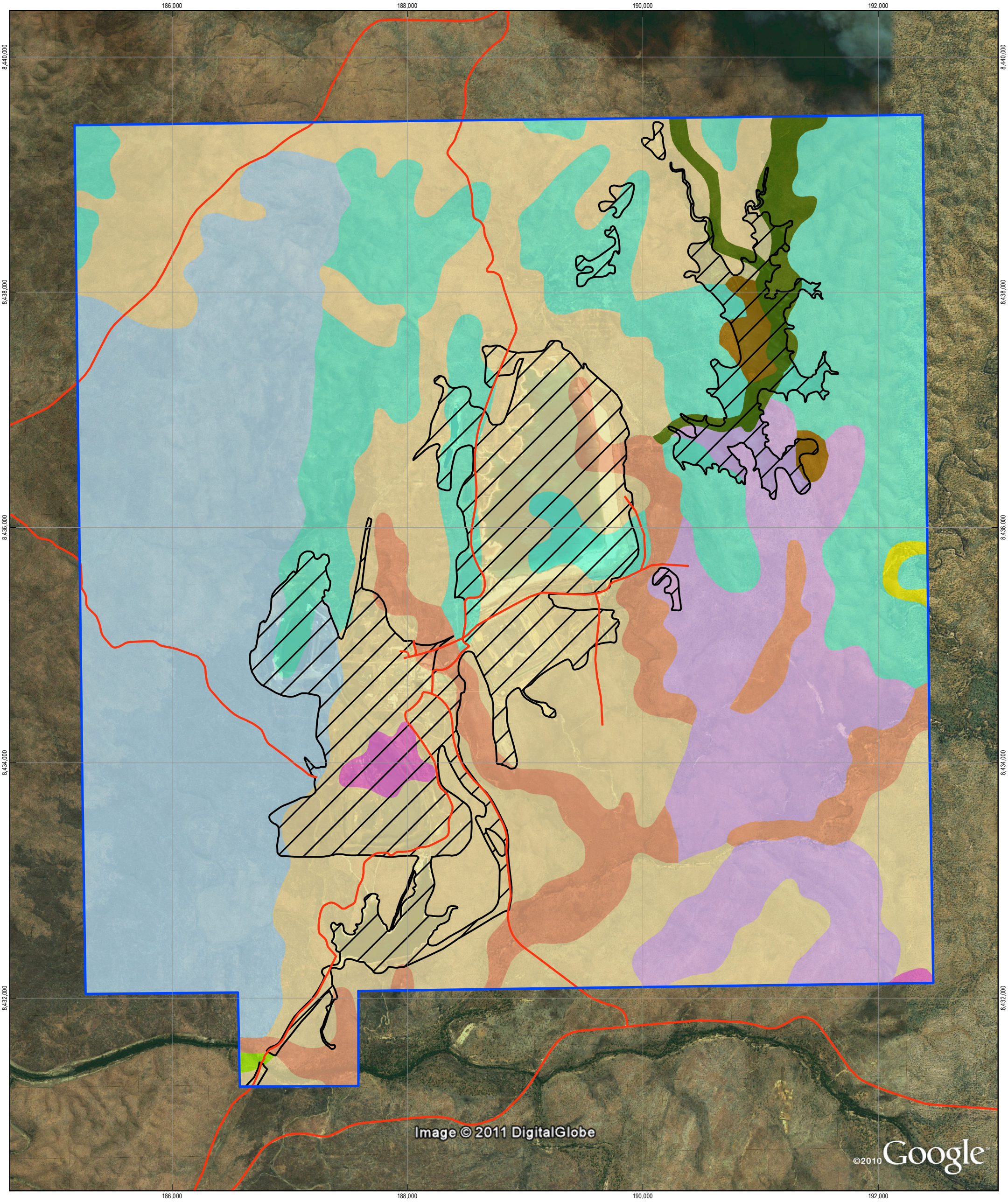
Local Vegetation Types

Figure 4-1

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_205.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: NRETAS/GHD - Vegetation (1990 (Edited by GHD: 2012)). Vista Gold - Mining Lease (2011), GHD - Roads (2011), Proposed Future Vegetation Disturbance (2012). Created by: CM



LEGEND

- Roads
- Mount Todd Mineral Lease Extents
- Disturbed Vegetation

Community

- 1 *Corymbia latifolia, Eucalyptus bigalerita, Erythrophleum chlorostachys, Eucalyptus spp.* open-forest
- 2 *Melaleuca spp., Syzygium spp.*, riparian open-forest on sandstone
- 7 *Erythrophleum chlorostachys, Eucalyptus tintinnans, Eucalyptus spp.* woodland
- 10 *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland
- 12 *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp.* woodland
- 13 *Eucalyptus phoenicea, Corymbia latifolia* low woodland - woodland (scattered *Eucalyptus tintinnans*)
- 16 *Corymbia dichromophloia, Erythrophleum chlorostachys* woodland (scattered *Eucalyptus tintinnans*)
- 38 *Corymbia latifolia, Eucalyptus bigalerita* open woodland with areas of grassland
- 50 Man made clearings,infrastructure
- 51 *Eucalyptus spp., Melaleuca spp., Lophostemon spp., Syzygium spp.* mixed species woodlands to open forest along watercourses, alluvial flats and creek lines

1:30,000 (at A3)

0 250 500 750 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Regional Vegetation Types within Mineral Leases

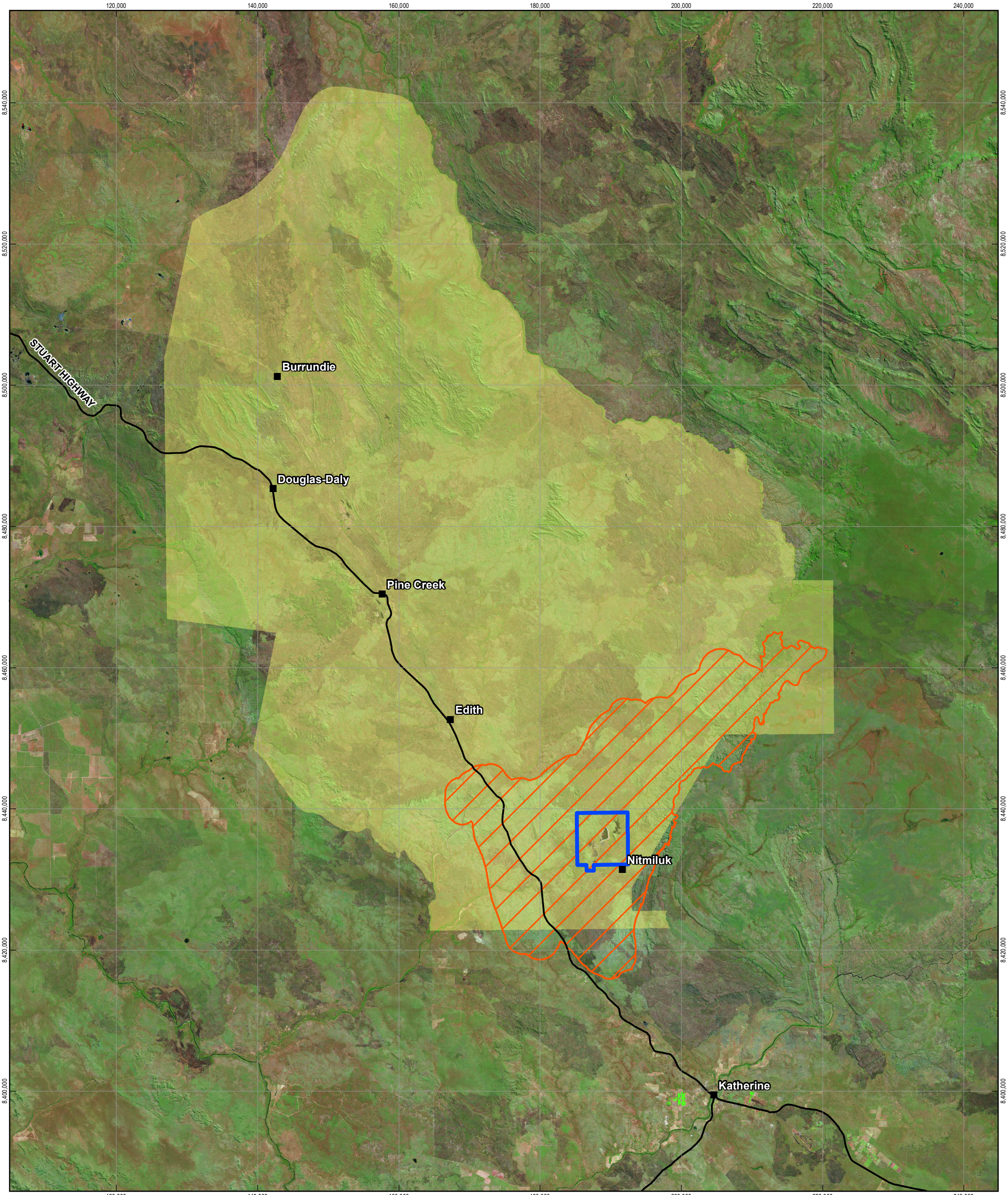
Job Number 43-21801
Revision 1
Date 27 May 2013

Figure 4-2

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_208.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: NRETAS - Vegetation (1990). Vista Gold - Mining Lease (2011). Google Earth Pro - Imagery (Date Extracted: 18/11/2011). GHD - Roads (2011). Created by: CM



LEGEND

- Named Places
- Roads
- Mount Todd Mineral Lease Extents
- Yinberrie Hills SOCS
- NRETAS 250k Gouldian Finch Vegetation Data

1:500,000 (at A3)

0 5 10 15 20

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number	43-21801
Revision	1
Date	27 May 2013

Regional Vegetation Types between Katherine and Pine Creek

Figure 4-3

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_209.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: NRETAS - Vegetation (1990), Yinberrie Hills SOCS (2012). Vista Gold - Mining Lease (2011). Geoscience Australia - Imagery, Roads, Named Places (2017). Created by: CM

Table 4-2 Regional Vegetation Types in the Mineral Leases

Vegetation Type	Area (ha)	Description (Wilson and Clark 1990)
1	398.06	*Corymbia latifolia, Eucalyptus bigalerita, Erythrophleum chlorostachys, Eucalyptus spp*. open-forest
2*	10.88	*Melaleuca spp., Syzygium spp*., riparian open-forest on sandstone
7	3.59	*Erythrophleum chlorostachys, Eucalyptus tintinnans, Eucalyptus spp.* woodland
10	1138.97.16	*Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland
12	1914.53	*Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland
13	1234.21	*Eucalyptus phoenicea, Corymbia latifolia* low woodland - woodland(scattered *Eucalyptus tintinnans*)
16	582.13	*Corymbia dichromophloia, Erythrophleum chlorostachys* woodland (scattered *Eucalyptus tintinnans*)
38	32.97	*Corymbia latifolia, Eucalyptus bigalerita* open woodland with areas of grassland
50	34.08	Man made clearings, infrastructure
51	113.08	*Eucalyptus spp., Melaleuca spp., Lophostemon spp., Syzygium spp*. mixed species woodlands to open forest along watercourses, alluvial flats and creek lines

4.2 Description of Local Scale Vegetation Communities

Vegetation Type 1: Melaleuca forest, with bare areas

NVIS Level V Classification - U+ ^*Eucalyptus camaldulensis*, *Melaleuca leucadendra*, *Melaleuca argentea*\^tree\7\r; M ^*Barringtonia sp*., *Pandanus aquaticus*, *Acacia holosericea*\^tree, palm\6\i; G ^*Mnesithea rottboellioides*, *Paspalum scrobiculatum*\^tussock grass\3\i.

This riparian woodland is characterised by *Eucalyptus camaldulensis* with *Melaleuca leucadendra* and *Melaleuca argentea* to 15- 25 metres over a mid-story to 2 metres dominated by *Barringtonia sp., Pandanus aquaticus* and *Acacia holosericea* over a *Mnesithea rottboellioides* and *Paspalum scrobiculatum* tall open tussock grassland.

Other common species include *Acacia neurocarpa, A. auriculiformis, Carallia brachiata, Commelina difformis* and *Lophostemon lactifluus.*

Photo 4-1 Vegetation Type 1: Melaleuca Forest, with Bare Areas

This vegetation type forms the riparian zone of the Edith River in the far south of the mineral leases. Water is present in the river all year round. It becomes a chain of pools in the latter parts of the dry season with bare areas of mobile sediment reworked during wet season flooding.

There are moderate to dense infestations of the introduced vine *Passiflora foetida* throughout this community.

This vegetation type covers approximately 15ha (0.27%) of the investigation area. Within the regional context this vegetation type is most similar to *Melaleuca spp., Syzygium spp*., riparian open-forest on sandstone (vegetation type 2) mapped by Wilson and Clark (1990). The area of this vegetation type present within the MLNs represents approximately 1.5% of vegetation mapped as *Melaleuca spp., Syzygium spp*., riparian open-forest on sandstone within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Melaleuca forest and woodlands major vegetation group. The area of this vegetation within the MLNs represents 0.012% of this major vegetation group.

Representative wet season quadrat numbers 10, 11 (Figure 3-1).

Vegetation Type 2: Eucalyptus bigalerita, E. spp. open forest*

NVIS Level V Classification - U+ ^*Eucalyptus bigalerita*, *Corymbia confertiflora*, *Eucalyptus tectifica*\^tree\7\r; M ^*Erythrophleum chlorostachys*, *Buchanania obovata*\^shrub\4\r; G ^*Sarga timorense, Themeda arguens, Mnesithea rottboellioides*\^tussock grass\4\c

This open woodland community is dominated by *Eucalyptus bigalerita* to 18 metres with occasional *Corymbia confertiflora* and *Eucalyptus tectifica* over a sparse shrub layer to 2 metres tall of *Erythrophleum chlorostachys* and *Buchanania obovata*. The ground story is a tall closed tussock grassland (70-80 % cover) *of Sarga timorense, Themeda arguens* and *Mnesithea rottboellioides*.

Other common species are *Desmodium trichostachyum, Ampelocissus frutescens, Mitracarpus hirtus, Desmodium sp 'Pine Creek', Vigna radiata* var *sublobatus, Vigna vexillata* var *angustifolia, Urena lobata* and *Alloteropsis semialata.*

Photo 4-2 Vegetation Type 2*: *Eucalyptus bigalerita, E. spp.* open forest

This vegetation type occurs on clayey floodplains in riparian zones (including the Edith River) mostly in the south and centre of the mineral leases.

There are sparse infestations of the introduced herb *Hyptis suaveolens* throughout this community.

This vegetation type covers approximately 367ha (6.72%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Eucalyptus spp., Melaleuca spp., Lophostemon spp., Syzygium spp*. mixed species woodlands to open forest along watercourses, alluvial flats and creek lines (vegetation type 51) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 0.89% of vegetation mapped as *Eucalyptus spp., Melaleuca spp., Lophostemon spp., Syzygium spp*. mixed species woodlands to open forest along watercourses, alluvial flats and creek lines within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Eucalyptus open forest major vegetation group. The area of this vegetation within the MNLs represents 0.22% of the vegetation mapped Eucalyptus open forest within the Pine Creek Bioregion. Representative wet season quadrat numbers 3, 12 (Figure 3-1).

Vegetation Type 4: Eucalyptus tintinnans, E. spp., Erythrophleum chlorostachys woodland*

NVIS Level V Classification - U+ ^*Eucalyptus tintinnans, Erythrophleum chlorostachys*\^tree\7\r; M ^*Petalostigma quadriloculare, Xanthostemon paradoxus, Cochlospermum fraseri*\^shrub, tree\1\r; G ^*Themeda arguens, Alloteropsis semialata, Chrysopogon fallax*\^tussock grass\2\i

This low open woodland to 12 metres is dominated by *Eucalyptus tintinnans* and *Erythrophleum chlorostachys* with a mixture of lesser co-dominant eucalypt species. The sparse midstorey to 5 metres is dominated by *Petalostigma quadriloculare*, *Xanthostemon paradoxus* and *Cochlospermum fraseri* shrubland over a ground layer of *Themeda arguens*, *Alloteropsis semialata* and *Chrysopogon fallax* mid open tussock grassland.

Other common species include *Schizachyrium fragile, Helicteres sp. Darwin, Brachiaria holosericea, Galactia muelleri,* and *Calytrix exstipulata*.

Photo 4-3 Vegetation Type 4*: *Eucalyptus tintinnans, E. spp., Erythrophleum chlorostachys* woodland

This vegetation type occurs on rocky hills with skeletal soils. It occurs throughout the mineral leases mostly in the north and west. The tree layer is low and the ground storey is dominated by annual grasses and is often bare. The species composition and structure of these areas are influenced by fire disturbance.

This vegetation type covers approximately 1690ha (30.95 %) of the investigation area.

Representative wet season quadrat numbers 5, 9 (Figure 3-1.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland (vegetation type 10) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 4.1 % of vegetation mapped as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.07% of the vegetation mapped Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Vegetation Type 4 (degraded): Eucalyptus tintinnans, E. spp., Erythrophleum chlorostachys woodland*

A degraded type of this vegetation occurs as a legacy of past mining activity. It is likely to predate the Batman Mine. It has the characteristic species of vegetation type 4 with these occurrences likely to be a mixture of remnant and regrowth. The structure of the vegetation is modified with less cover in all strata because the ground area is disturbed by tracks, costeans, stockpiles and other earthworks. There is a greater presence of *Calytrix spp.*: a species known to respond positively to disturbance.

This degraded vegetation type covers approximately 60ha (1.11%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland (vegetation type 10) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 0.15 % of vegetation mapped as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.003% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Vegetation Type 6: Eucalyptus tintinnans, C. dicromophloia woodland*

NVIS Level V Classification - U+ ^*Corymbia dichromophloia, Eucalyptus tintinnans*\^tree\7\r; M ^*Cochlospermum fraseri, Erythrophleum chlorostachys, Xanthostemon paradoxus*\^shrub, tree\4\r; G ^*Alloteropsis semialata, Sarga timorense, Sarga intrans*\^tussock grass\3\i

This open woodland is characterised by *Corymbia dichromophloia* and *Eucalyptus tintinnans* to over 12 metres over a sparse shrub layer dominated *by Cochlospermum fraseri, Erythrophleum chlorostachys* and *Xanthostemon paradoxus* to 3 metres, over a *Alloteropsis semialata, Chrysopogon fallax, Sarga timorense* and *Sarga intrans* dominated tall open tussock grassland.

Other common species include *Petalostigma quadriloculare, Schyzachyrium fragile, Fimbristylis cinnamometorum, Alphitonia excelsa, Themeda arguens, and Tephrosia polyzyga.*

This vegetation type occurs in a similar landscape position to vegetation type 4, differing mostly in the presence of *C. dicromophloia* as a co-dominant tree with *E. tintinnans* and a lesser dominance of *Erythrophleum chlorostachys*. The ground storey is dominated by annual grasses and is susceptible to fire. It occurs throughout the mineral leases, mostly in the north and west.

This vegetation type covers approximately 734 ha (13.44%) of the investigation area.

Photo 4-4 Vegetation Type 6*: *Eucalyptus tintinnans, C. dicromophloia* woodland

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland (vegetation type 10) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 1.8 % of vegetation mapped as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.03% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Representative wet season quadrat numbers 4, 8 (Figure 3-1).

Vegetation Type 6 (degraded): Eucalyptus tintinnans, C. dicromophloia woodland*

A degraded type of vegetation type 6 occurs as a legacy of past mining activity likely predating the Batman Mine. This has the characteristic species of the community with these occurrences likely to be a mixture of remnant and regrowth. The structure of the vegetation is modified with less cover in all strata as the ground area is disturbed by tracks, costeans, stockpiles and other earthworks. There is also a greater presence of *Calytrix spp.*: a species known to respond positively to disturbance.

This degraded vegetation type covers approximately 49 ha (0.91%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland (vegetation type 10) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 0.12 % of vegetation mapped as *Corymbia dichromophloia, Eucalyptus tintinnans, Erythrophleum chlorostachys* woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.02% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Vegetation Type 9: Eucalyptus tectifica woodland*

NVIS Level V Classification - U+ ^*Eucalyptus tectifica*\^tree\7\r; M ^*Erythrophleum chlorostachys, Terminalia ferdinandiana, Acacia hemignosta*\^tree, shrub\6\r; G ^*Sarga timorense, Themeda arguens*\^tussock grass\3\c

This low open woodland is characterised by sparely distributed *Eucalyptus tectifica* to 12 metres with *Erythrophleum chlorostachys* appearing as a lesser co-dominant. The shrub-layer reaches 3 metres in height and is dominated by, *Terminalia ferdinandiana* and *Acacia hemignosta*. The ground layer of this community is tall tussock grassland, to 2 metres dominated by *Sarga timorense* and *Themeda arguens*.

Other common species include *Ampelocissus frutescens, Tacca leontopetaloides, Crotalaria montana, Galactia mulleri and Tephrosia polyzyga.*

This vegetation type occurs on the valleys and hillsides lower down the rocky hills than vegetation types 4 and 6.

This vegetation type covers approximately 1385 ha (25.36%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland (vegetation type 12) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 0.78 % of vegetation mapped as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland within the Katherine- Pine Creek region.

Photo 4-5 Vegetation Type 9*: *Eucalyptus tectifica* woodland

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.06% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Representative wet season quadrat numbers 2, 7 (Figure 3-1).

Vegetation Type 10: Eucalyptus tectifica, Corymbia confertiflora woodland

NVIS Level V Classification- U+ ^*Corymbia confertiflora, Eucalyptus miniata, Eucalyptus tectifica*\^tree\7\r; M ^*Terminalia ferdinandiana, Erythrophleum chlorostachys, Buchanania obovata*\^shrub\3\r; G ^*Themeda arguens, Sarga timorense, Heteropogon contortus*\^tussock grass\3\c

This open woodland community is dominated by *Corymbia confertiflora, Eucalyptus miniata and Eucalyptus tectifica* to 18 metres over a sparse shrub layer to 3 metres dominated by *Terminalia ferdinandiana, Erythrophleum chlorostachys* and *Buchanania obovata* over *Themeda arguens, Sarga timorense* and *Heteropogon contortus* tussock grassland to two meters.

Other common species include *Desmodium remotiflora, Uraria lagopodioides, Paspalum scrobiculatum, Panicum paludosum, Vigna vexillata* var *angustifolia, Vigna radiata* var. *sublobata, Galactia muelleri, Tephrosia varians, Ipomoea graminea* and *Polygala eriocephala.*

This vegetation type occurs in only one patch along the entry road at the southern extent of the mine site. It occurs on an open floodplain with a very sparse tree layer. The floristics of this community are similar to vegetation type 9 (Wilson and Clark 1990) however the landscape position and more open structure are sufficiently different to that of vegetation type 9 to warrant a separate designation.

This vegetation type covers approximately 42 ha (0.78%) of the investigation area.

Photo 4-6 Vegetation Type 10: *Eucalyptus tectifica, Corymbia confertiflora* woodland

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland (vegetation type 12) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 0.02 % of vegetation mapped as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.002% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Representative wet season quadrat numbers 13, 14 (Figure 3-1).

Vegetation Type 11: Corymbia latifolia, Eucalyptus bigalerita open-woodland with areas of grassland*

NVIS Level V Classification - U+ ^*Corymbia latifolia, Eucalyptus tectifica, Eucalyptus bigalerita*\^tree\7\i; M ^*Terminalia ferdinandiana, Erythrophleum chlorostachys*, *Terminalia pterocarya*\^shrub, tree\4\r; G ^*Themeda arguens, Sarga timorense, Heteropogon triticeus*\^tussock grass\3\d.

This low woodland community is characterised by *Corymbia latifolia, Eucalyptus tectifica and Eucalyptus bigalerita* to 15 metres over a shrub layer dominated by *Terminalia ferdinandiana*, *Erythrophleum chlorostachys* and *Terminalia pterocarya* to 4 metres over a *Themeda arguens*, *Sarga timorense* and *Heteropogon triticeus* dominated tall, closed tussock grassland to 1.7 metres.

Photo 4-7 Vegetation Type 11*: *Corymbia latifolia, Eucalyptus bigalerita* open-woodland with areas of grassland

Other common species include *Ampleocissus frutescens, Alloteropsis semialata, Galactia mulleri, Desmodium brownii, Schizachyrium fragile, Tephrosia polyzyga, Ipomoea graminea* and *Desmodium sp* 'Pine Creek'.

This vegetation type is found growing on clay in seasonally inundated drainage lines that lack perennial water. This vegetation type occurs in the centre and east of the mineral leases.

This vegetation type covers approximately 171 ha (3.13%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland (vegetation type 1) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 5.1 % of vegetation mapped as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.007% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Representative wet season quadrat numbers 1, 6 (Figure 3-1).

Vegetation Type 16: Eucalyptus tectifica woodland / E. tintinnans, E. spp., Erythrophleum chlorostachys woodland

NVIS Level V Classification – U+ ^*Eucalyptus tectifica, Eucalyptus tintinnans*\^tree\6\r; M ^*Erythrophleum chlorostachys, Galactia muelleri, Cochlospermum fraseri*\^shrub\4\r; G ^*Sarga timorense, Thaumastochloa major, Themeda arguens*\^tussock grass\2\c.

This low open woodland is characterised by *Eucalyptus tectifica* and *Eucalyptus tintinnans* to 12 metres over a shrub layer dominated by *Erythrophleum chlorostachys*, *Galactia muelleri* and *Cochlospermum fraseri* to 3.5 metres over sparse tussock grassland dominated by *Sarga timorense, Thaumastochloa major* and *Themeda arguens*.

Other common flora species include *Helicteres* sp*. Darwin, Petalostigma quadriloculare, Tephrosia polyzyga* and *Zornia prostrata.*

This vegetation type is represented by one patch in the far south east of the mineral leases. It occurs as a mixed woodland on a rocky hillside with skeletal soils. The ground layer is sparse and dominated by annual grasses.

This vegetation type covers approximately 58 ha (1.07%) of the investigation area.

Within the regional context this vegetation type is most similar to the vegetation type mapped by Wilson and Clark as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland (vegetation type 1) (Wilson and Clark 1990). The area of this vegetation type present within the MLNs represents approximately 1.7 % of vegetation mapped as *Eucalyptus tectifica, Eucalyptus latifolia, Eucalyptus tintinnans, Eucalyptus spp*. woodland within the Katherine- Pine Creek region.

At a bioregional scale this vegetation type would be included in the Tropical Eucalyptus woodland/grassland major vegetation group (DSEWPaC 2009). The area of this vegetation within the MNLs represents 0.002% of the vegetation mapped as Tropical Eucalyptus woodland/grassland within the Pine Creek Bioregion.

Representative wet season quadrat numbers 15, 16 (Figure 3-1).

Photo 4-8 Vegetation Type 16: *Eucalyptus tectifica woodland / E. tintinnans, E. spp., Erythrophleum chlorostachys* woodland

4.2.1 *Eucalyptus tintinnans* Woodlands

E. tintinnans dominated woodlands in the mineral leases occur as two distinct vegetation types:

- VT 4: *Eucalyptus tintinnans, E. spp., Erythrophleum chlorostachys* woodland, and
- *VT 6: E. tintinnans, C. dichromophloia* woodland.

An agglomerative hierarchical classification using the Bray and Curtis association measure was used to classify the 19 flora plots using the intrinsic variables describing tree species presence, abundance and diversity between areas currently disturbed and those largely undisturbed where disturbance is proposed. The results are shown in Table 4-3.

The data in Table 4-3 shows that the presence of *Corymbia dichromophloia* and *Erythrophleum chlorostachys* differs between vegetation types 4 and 6 (as expected). There is no significant difference in the presence of *E. tintinnans*.

4.2.2 Grass Species Trends across the Mineral Leases

The PATN analysis using the Bray Curtis classification on floristic cover/abundance data from the wet season quadrats for the mine site show a high degree of heterogeneity across the whole site. The shrub and ground layer vegetation were removed into extrinsic data and the analysis conducted again (Appendix A). The classification based on the upper canopy species alone indicated the following groupings of quadrats (wet season quadrat numbers used):

- Group 1:
  - Quadrat 1 grouped with quadrat 2; and
  - Quadrat 15 grouped with quadrat 16.
- Group 2:
  - Quadrat 4 grouped with quadrat 5; and
  - Quadrat 8 grouped with quadrat 9.

Analysing the distributions of the wet season flora quadrats (Figure 3-1), this grouping equates to an east (group 1)/west (group 2) grouping of quadrats.

Although not involved with or contributing to the classification, a large factor in the extrinsic data relating to these groupings is the presence of *Sarga timorense*. *S. timorense* is present in reasonably high abundance in the eastern sites (group 1) and present in lower abundances in the western sites (group 2).

The quadrat data also show that in those western sites (group 2) devoid of *S. timorense* there is a presence of *Alloteropsis semialata*. The quadrats where *A. semialata* is most abundant are 8 and 9 (50% and 30% cover respectively). *A. semialata* is mostly absent from the eastern sites. Plots 4 and 5 are also the only plots in the mine site where *Chrysopogon fallax* (3% and 1% cover respectively) was recorded. Adding to this diversity is the observation of *Triodia bitextura* near and surrounding quadrat 4. This grass was not observed in the east.

Table 4-3 Structural Classification Comparisons between Quadrats in Vegetation Types 4 and 6

Question	Test	Representation of Vegetation Type	P Value	Conclusion
Does Corymbia *dichromophloia* stem count differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 0) VT 6 (n=10; median = 1)	0.012	Yes there is a difference between communities based on stem count for *Corymbia dichromophloia*
Does *Corymbia dichromophloia* basal stem areas (based on bitterlich gauge scores differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 2) VT 6 (n=10; median = 3)	0.035	Yes there is a difference in basal stem areas between communities based on bitterlich gauge scores for *Corymbia dichromophloia*
Does *Eucalyptus tintinnans* stem count differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 1) VT 6 (n=10; median = 0)	0.218	No there is not a difference between communities based on stem count for *Eucalyptus tintinnans*
Does *Eucalyptus tintinnans* bitterlich gauge scores differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 2) VT 6 (n=10; median = 0.75)	0.141	No there is not a difference between communities based on bitterlich gauge scores for *Eucalyptus tintinnans*
Does stem diversity differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 1) VT 6 (n=10; median = 0.67)	0.021	Yes there is a difference between communities based on stem diversity
Does *Erythrophleum chlorostachys* bitterlich gauge scores differ between vegetation types 4 and 6	Mann Whitney U Test	VT 4 (n=9; median = 2) VT 6 (n=10; median = 1)	0.017	Yes there is a difference between communities based on *Erythrophleum chlorostachys* bitterlich gauge scores

4.3 Sensitive or Significant Vegetation Types (NT Land Clearing Guidelines)

The NT Land Clearing Guidelines identify a number of sensitive or significant vegetation types to avoid clearing including rainforests, monsoon vine thicket, riparian or closed forests. The vegetation types on the mineral lease conforming with any of these vegetation types are the riparian forests in vegetation type 1 along the Edith River and vegetation type 2 along Stow Creek.

4.4 Flora

NT Government flora records for the site plus a 10 km buffer list 840 species (from 8,261 individual records). Wilson and Clark (1990) identified 173 taxa, of which 29 were not listed on the NT Government flora records.

GHD's survey identified 226 taxa, of which 67 were not previously recorded on the DLRM (formerly NRETAS) or Wilson and Clark (1990) lists. The total number of species known from the area is now 959.

4.4.1 Threatened Flora

The PMST did not predict the occurrence of any flora species of national significance (EPBC-listed) within 10km of the study area.

One threatened flora species (*Utricularia singeriana*) is known or predicted to occur in the locality. This species is listed as Vulnerable under the TPWC Act. It occurs along seasonally waterlogged margins of drainage lines with sparse short grasses and sedges (Cowie 2010; Woinarski *et al.* 2007).

The NT Government flora records indicate a record of this species from approximately six kilometres west of the western border of the mineral leases. GHD botanists visited the location of this record in May 2011 and did not relocate any individuals or populations of this species.

The location of this *U. singeriana* record is a seasonally inundated drainage line with low granite outcropping at the upper reaches of VT 11 where it intersects with VT 8 (*E. phoenicea* woodland) (Wilson and Clark 1990). The soil is a heavy clay of light brown colour near the granite outcropping and black in colour further away from the outcropping. The area was dry at the time of the site assessment. There was evidence of pig and buffalo use of the drainage line in the previous months when the area was inundated during and after the previous wet season. The vegetation is characterised by a sparse upper storey dominated by *Melaleuca viridiflora* with occasional *Terminalia ferdinandiana*. There was no mid storey and the ground storey was dominated by the grasses *Eulalia aurea* and *Themeda triandra* with herbs and sedges characteristic of seasonally inundated areas (*Cyperus pulchellus, Fuirena ciliaris, Rhynchospora sp., Drosera indica, Eriocaulon sp.* and *Utricularia chrysantha*). The grasses were more densely distributed at the centre (i.e. the lower parts) of the drainage line.

Only one location with a similar vegetation assemblage was identified in the mineral leases. As shown in Figure 4-4, this location is marginally outside the upper reaches of VT 11 where it intersects with VT 9 (*E. tectifica* woodland). Individuals or populations of *U. singeriana* were not identified at this location during the May 2011 or February 2012 field assessments, however this was not an ideal time of year to be surveying for this cryptic and ephemeral species. As such its presence at the site cannot be discounted.

The soil type at this location was black heavy clay, not the brown clay observed at the known *U. singeriana* location. There was no granite outcropping observed at this location. There is limited available evidence on the influence soil type or outcropping has on the presence of *U. singeriana*. The absence of granite outcropping is not used as a factor in determining the likely presence of *U. singeriana* and the location shown in Figure 4-4 is determined as possible habitat for *U. singeriana*.

4.4.2 Regionally Significant Flora

National and Territory significant flora

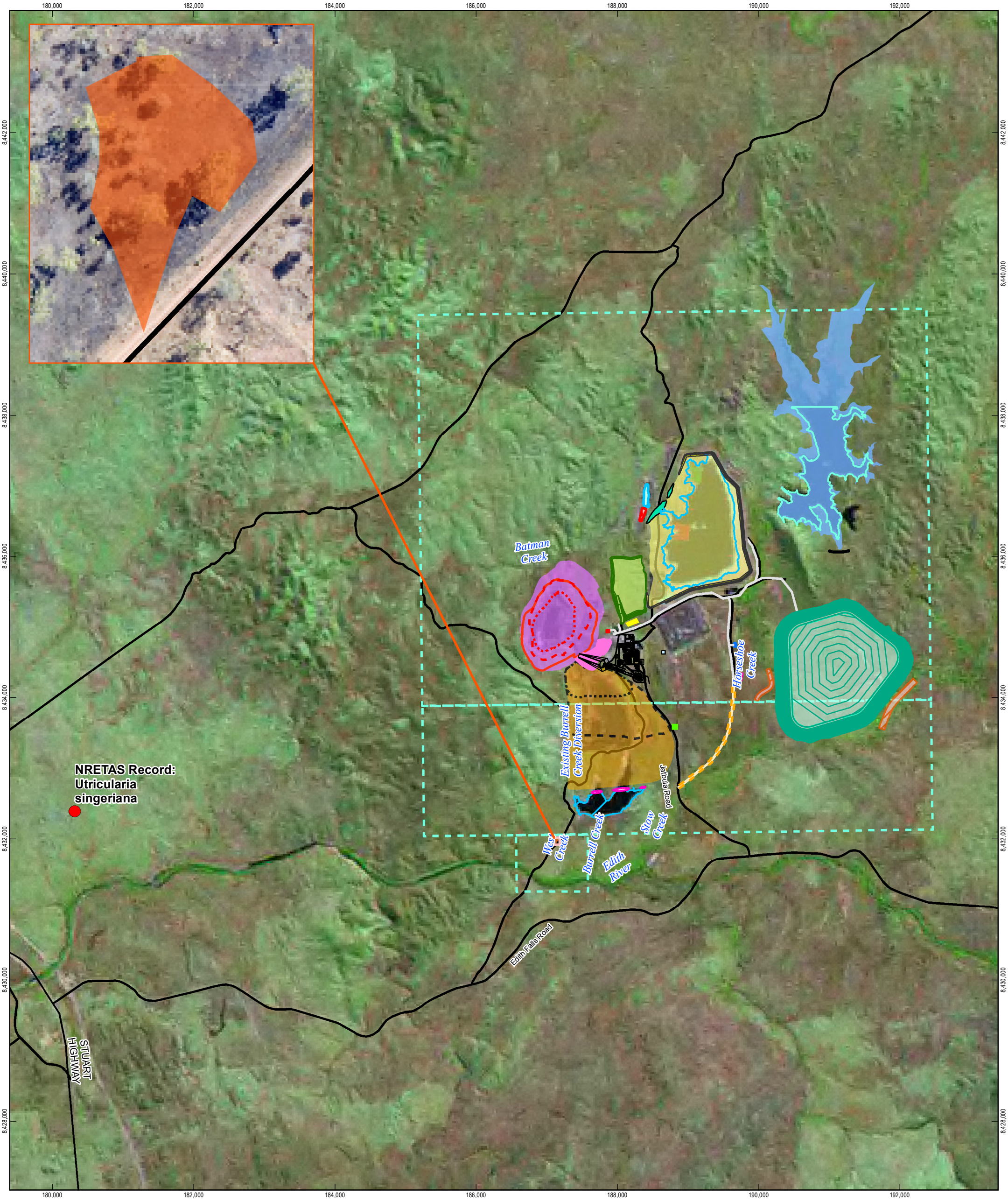
No nationally significant species were recorded in or are likely to occur in the mineral leases.

Regionally significant flora

One flora taxon with regional significance was recorded in the mineral lease. This species (*Fimbristylis fimbristyloides*) is endemic to the Pine Creek Bioregion and recorded in vegetation type 4 (NRETAS 2005).

4.4.3 Introduced Flora

Introduced flora is abundant around the previous mine facilities and infrastructure. It is largely absent from the undeveloped areas of the mineral leases. The definitive source of the introduced flora species is unknown. It is likely that the construction and operation of the previous mines has led to the establishment of numerous introduced flora species. The species of weeds identified on-site or known from the area in NT Government flora records are listed in Table 4-4. Figure 4-5 shows the distribution of weed species observed during field surveys.



LEGEND

- NRETAS *U, singeriana* Record
- Extents of Potential *U, singeriana* Habitat
- Mt Todd Mineral Leases
- Roads
- Process Plant
- TSF1 Contours
- Low Grade Ore Stockpile Contours
- TSF2 Contours (Year 12)
- Golf Pit
- Tollis Pit
- Fuel Bays
- Proposed Maintenance Shop
- Power Plant
- Proposed Haul Road
- Re-aligned Access Road
- Coffer Dams
- ANFO Facility
- Explosives Magazine
- Diversion Channels
- Raw Water Dam Existing Water Body
- Indicative Raw Water Dam
- TSF1 Existing Water Body
- Proposed Saddle Dam
- TSF1
- Low Grade Ore Stockpile
- TSF2 Impounded Surface Area (Year 12)
- TSF2 Footprint (Year 12)
- Water Treatment Plant
- Proposed Saddle Dam (Raw Water Dam)
- Retention Pond 1
- Stockpile
- Waste Rock Dump
  - Year 1
  - Year 2
- Ultimate Boundary
- Batman Pit
  - Year -1
  - Year 1
  - Year 3
  - Year 5

0 500 1,000 1,500 2,000
Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

CLIENTS | PEOPLE | PERFORMANCE

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Known and potential habitat of *U. singeriana*

Job Number 43-21801
Revision 1
Date 27 May 2013

Figure 4-4

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_203E.mxd

66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Tetra Tech - Process Plant, Golf Pit, Tollis Pit, Fuel Bays, Proposed Maintenance Shop, Power Plant, Realigned Roads, Proposed Haul Road, Coffer Dams, ANFO Facility, Explosives, Diversion Channels, Raw Water Dam Existing Water Body, Indicative Raw Water Dam, TSF1 Contours, TSF1 Existing Water Body, Proposed Saddle Dam, TSF1, Low Grade Ore Stockpile Contours, Low Grade Ore Stockpile, TSF2 Impounded Surface Area, TSF2 Contours, TSF2 Footprint, Water Treatment Plant, Batman Pit Contours, Proposed Saddle Dam (Raw Water Dam), Retention Pond 1, Batman Pit Footprint, Waste Rock Dump Contours, Waste Rock Dump Footprint, Stockpile (2013). NRETAS - Flora Records (2011). Geoscience Australia - Imagery (2007). GHD - Access Roads, Creek Names (2011). Created by: CM

Table 4-4 Introduced Flora on the Mineral leases

Species Name	Common Name	Schedule Class*	Observed	NT Gov't Flora Records
*Andropogon gayanus***	Gamba grass	B	✓	✓
Calotropis procera	Rubber bush	NA***	✓	✓
Cenchrus ciliaris	Buffel grass	NA	✓	
Chloris gayana	Rhodes grass	NA	✓	
Crotalaria goreensis	Gambia pea	NA	✓	
Hibiscus sabdariffa	Rosella	NA****	✓	✓
Hyptis suaveolens	Hyptis	B***	✓	✓
Jatropha gossypifolia	Bellyache bush	A & B		✓
Martynia annua	Devil's claw	A		✓
Melinis repens	Red Natal grass	NA	✓	✓
Passiflora foetida	Stinking passionfruit	NA***	✓	✓
Pennisetum pedicellatum	Mission grass	NA	✓	✓
Pennisetum polystachyon	Mission grass	B	✓	✓
Senna occidentalis	Coffee senna	B		✓
Sida acuta	Spiny-head sida	B		✓
Stylosanthes hamata	Carribean stylo	NA	✓	
Xanthium strumarium	Noogoora burr	B		✓

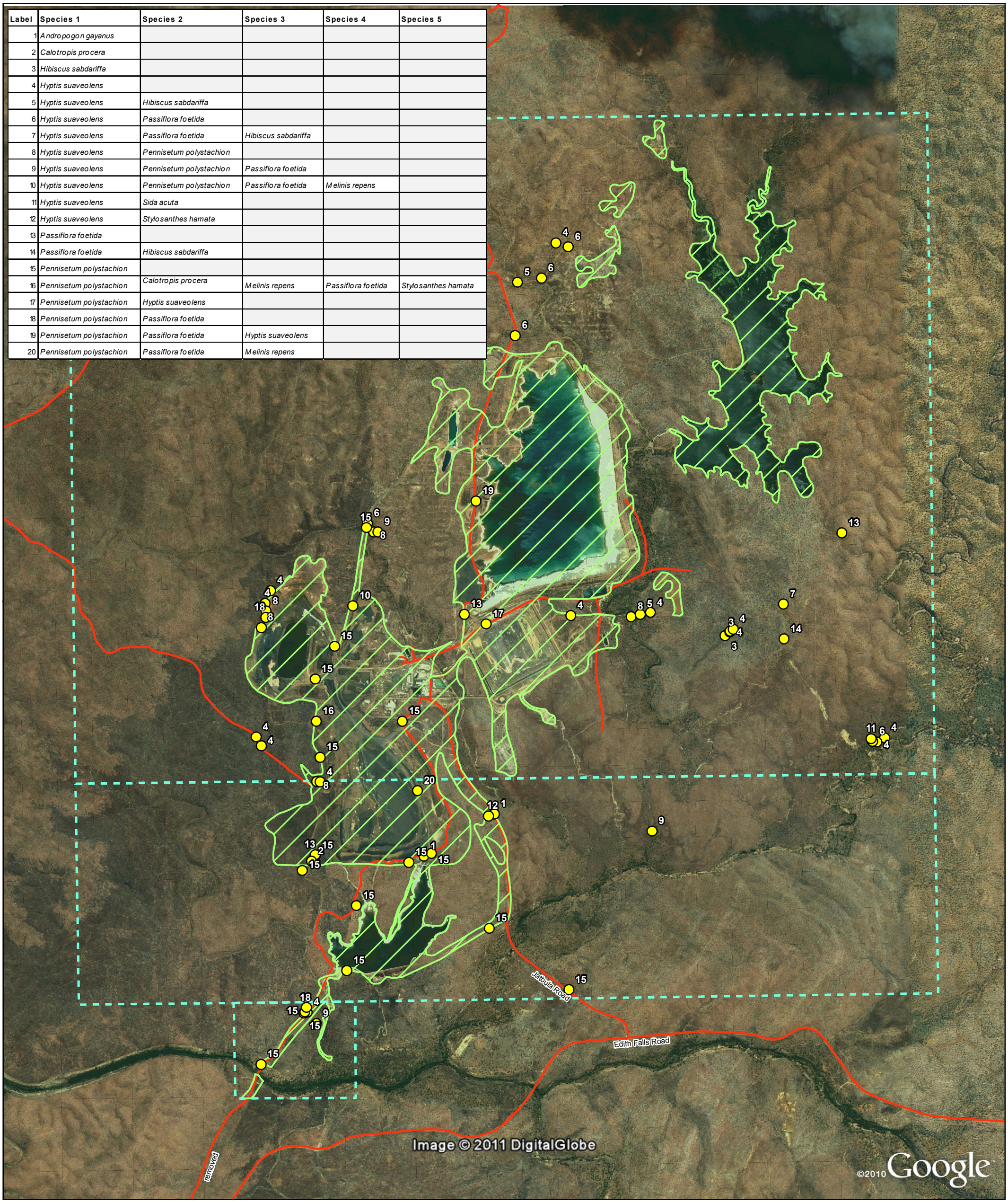
*note: Schedule Class as determined under the WM Act. All Schedule Class A and B weeds in the NT are also Scheduled as Class C weeds.

**note: Field assessment identified only one individual within the mineral leases (excluding the access road from Edith Falls Road). Since field assessment Vista Gold site personnel have advised GHD that this individual has been removed (email from Colin Forscutt/Howard Harlan (Vista Gold) to Matthew Flower (GHD) 23/5/11).

***note: This species is noted by NRETAS (now DLRM) as being of concern to the ecological integrity of the NT savannahs (NRETA 2007a).

****note: This species is listed as a weed of concern to the ecological integrity of the Yinberrie Hills (NRETA 2007b)

Label	Species 1	Species 2	Species 3	Species 4	Species 5
1	*Andropogon gayanus*				
2	*Calotropis procera*				
3	*Hibiscus sabdariffa*				
4	*Hyptis suaveolens*				
5	*Hyptis suaveolens*	*Hibiscus sabdariffa*			
6	*Hyptis suaveolens*	*Passiflora foetida*			
7	*Hyptis suaveolens*	*Passiflora foetida*	*Hibiscus sabdariffa*		
8	*Hyptis suaveolens*	*Pennisetum polystachion*			
9	*Hyptis suaveolens*	*Pennisetum polystachion*	*Passiflora foetida*		
10	*Hyptis suaveolens*	*Pennisetum polystachion*	*Passiflora foetida*	*Melinis repens*	
11	*Hyptis suaveolens*	*Sida acuta*			
12	*Hyptis suaveolens*	*Stylosanthes hamata*			
13	*Passiflora foetida*				
14	*Passiflora foetida*	*Hibiscus sabdariffa*			
15	*Pennisetum polystachion*				
16	*Pennisetum polystachion*	*Calotropis procera*	*Melinis repens*	*Passiflora foetida*	*Stylosanthes hamata*
17	*Pennisetum polystachion*	*Hyptis suaveolens*			
18	*Pennisetum polystachion*	*Passiflora foetida*			
19	*Pennisetum polystachion*	*Passiflora foetida*	*Hyptis suaveolens*		
20	*Pennisetum polystachion*	*Passiflora foetida*	*Melinis repens*		



LEGEND

- Flora Survey Weeds
- Access Roads
- Mt Todd Mineral Leases
- Disturbed Area: Sporadic distribution of introduced species

0 250 500 750 1,000
Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53

N

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Job Number 43-21801
Revision 1
Date 27 May 2013

Introduced Flora Observed on the Mine Site

Figure 4-5

G:\43\21801\GIS\Maps 30000 TPA\FloraReport\4321801_204.mxd
66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com.au

Data source: Google Earth Pro - Imagery (Date Extracted: 18/11/2011). GHD - Access Roads, Flora Survey Weeds (2011), Disturbed Area (2012). Created by: CM

5 Potential Impacts

5.1 Vegetation Clearing

5.1.1 Local Scale Vegetation

Vegetation Change Since 1990

Alterations were made to Wilson and Clark's (1990) 1:50,000 scale vegetation mapping based on field observations and the interpretation of a high quality aerial image.

One patch of vegetation of approximately 220 hectares in size that was mapped as vegetation type 9 (*E. tectifica* woodland) in the north western corner of the mineral lease was confirmed in the field to be vegetation type 4 (*E. tintinnans, E. spp., Erythrophleum chlorostachys* woodland). Other alterations made to the Wilson and Clark mapping included small changes to the boundaries of vegetation types following field survey of the area.

The major change in vegetation cover since the Wilson and Clark (1990) 1:50,000 scale map appears to be the clearance of areas for the construction and operation of the Batman Mine. There are two areas of vegetation we have mapped as degraded types of other vegetation types (labelled vegetation types 4B and 6B) which have been subject to unknown disturbance over an unknown time period.

Outside vegetation clearance, the vegetation appears to have not been significantly impacted by the introduction of non-native flora species. The distribution of introduced flora is largely restricted to the interface between cleared areas and the bushland, the edges of roads and along creeks.

Proposed Vegetation Clearance Areas

Table 5-1 shows land clearing proposed for the Mt Todd Gold project. This table demonstrates that 49.69% of the required footprint of the project occurs in already cleared areas.

Table 5-1 Proposed Vegetation Clearance

Vegetation Grouping	Area
Non-disturbed vegetation	608.72
Degraded vegetation (area of vegetation type 4B)	28.83
Cleared area	629.58
Total	1267.13

A breakdown of all the proposed clearing by vegetation type is shown in Table 5-2. The data are presented to demonstrate the cumulative vegetation losses due to past mining activity using the modified Wilson and Clark (1990) 1:50,000 scale mapping relative to the proposed clearing for the Mt Todd Gold Project.

Table 5-2 Cumulative Local Scale Vegetation Loss in Mineral Leases pre-1990 – Current and Proposed

Local Scale Vegetation Map unit Number	Vegetation Type	Original Area (1990)	Loss Due to Activity 1990-Current (ha)	Loss of Original Area from Activity 1990-Current (%)	Proposed Loss due to Mt Todd Gold Project (ha)	Proposed Loss of Original Area (1990) from Mt Todd Gold Project (%)	Total Cumulative Loss from Mining if Mt Todd Project Occurs (ha)	Total Cumulative Loss from Mining if Mt Todd Project Occurs (%)
2	*E. bigalerita, E. spp* open forest	407.44	75.83	18.61	96.08	23.58	171.91	42.19
4*	*E. tintinnans, E. spp., Erythrophleum chlorostachys* woodland	1522.55	92.44	6.07	57.11	3.75	149.55	9.82
6*	*E. tintinnans, E. dicromophloia* woodland	723.26	62.96	8.70	83.17	11.50	146.13	20.20
9	*E. tectifica* woodland	2088.94	525.99	25.18	294.83	14.11	820.82	39.29
11	*Corymbia latifolia, E. bigalerita* open-woodland with areas of grassland	284.22	104.83	36.88	77.53	27.28	182.36	64.16
Total		**NA**	**888.54**	**NA**	**608.72**	**NA**	**1470.77**	**NA**

*Not included in this table as vegetation types are the areas covered by patches of these vegetation types that were modified or converted into what are now mapped as 'degraded' types of vegetation during activity 1990 – Current. It is assumed that the modification occurred during this time as the areas were mapped as vegetation types 4 and 6 respectively by Wilson and Clark (1990). The patches account for an additional 60.38 ha of vegetation type 4 (now mapped as 4B) and 49.77 ha of vegetation type 6 (now mapped as 6B).

Table 5-2 shows that the Mt Todd Gold Project proposes to clear less vegetation than was cleared during the period 1990-current. The five vegetation types to be cleared for the Mt Todd Gold Project are well represented in the mineral leases. Other vegetation types will remain untouched i.e. 73% of the vegetation in the Mineral Leases.

E. tintinnans Woodland Mapped at the Local Scale

Vegetation types 4 and 6 are *E. tintinnans* dominated woodlands. This discussion excludes the areas mapped as degraded vegetation types 4B and 6B. The Project will cause a loss of 57.11 ha and 83.17 ha of these vegetation types respectively.

Vegetation Type 4

Vegetation type 4 was reduced by 6.07% during the activity 1990-current and this project proposes a loss of 3.75% of this vegetation type in the mineral leases (based on original area mapped by Wilson and Clark 1990). The cumulative total of this vegetation type loss in the mineral leases from mining is 9.82%.

Vegetation Type 6

Vegetation type 6 was reduced by 8.70% during the activity 1990-current and this project proposes a loss of 11.50 % of this vegetation type in the mineral leases (based on original area mapped by Wilson and Clark 1990). The cumulative total of this vegetation type loss in the mineral leases from mining is 20.20 %.

Grass Species Trends across the Mineral Leases

As discussed in Section 4.2.1 there is generally a lower abundance of the annual *Sorghum timorense* in the *E. tintinnans* woodlands in the western part of the site than the eastern part of the site. The western *E. tintinnans* woodlands have a greater richness of other grasses including *Alloteropsis semialata, Chrysopogon fallax* and *Triodia bitextura*.

5.1.2 Regional Scale Vegetation

Vegetation mapped at the 1:250,000 scale does not entirely match the types and landscape features of the vegetation mapped at the local scale. These disparities are due to inherent problems with trying to compare vegetation which has been mapped at different scales (i.e. at a smaller the scale more detail is able to be provided in the mapping). At the larger scale vegetation types are often lumped together whilst finer scale mapping allows for subtle differenced in vegetation to be identified and mapped.

Table 5-3 below shows the result of equating the different scaled maps:

- Mapped by Wilson and Clark (1990) at 1:50,000 scale and modified as a result of this assessment based on high quality aerial photography interpretation and field observation; and
- 1:250,000 scales (Wilson and Clark 1990) including the current disturbance polygon.

Table 5-3 Regional Scale Vegetation Types in the Mineral Leases and their Relationship to Local Scale Vegetation Types

1:250,000 Vegetation Type	Area within MLNs (ha)	Wilson and Clark (1990) Regional Scale Description	Relationship to Local Scale Vegetation Types
1	398.06	*Corymbia latifolia, E. bigalerita, Erythrophleum chlorostachys, E. spp*. open-forest	Batman Creek, Stow Creek and Edith River drainage lines and riparian zones. Mapped at the local scale as *E. bigalerita, E. spp.* open forest (type 2) and *C. latifolia, E. bigalerita* open woodland with areas of grassland (type 11).
2*	10.88	*Melaleuca spp., Syzygium spp*., riparian open-forest on sandstone	Small part in extreme east in rocky hills east of TSF 2. Is mapped at the local scale as *E. bigalerita, E. spp.* open forest (type 2).
7	3.59	*Erythrophleum chlorostachys, E. tintinnans, E. spp.* woodland	Small part in mineral leases at extreme south. Area is south of Edith River and at the local scale mapped as *C. latifolia, E. bigalerita* open woodland with areas of grassland (type 11).
10	1138.97	*Corymbia dichromophloia, E. tintinnans, Erythrophleum chlorostachys* woodland	Woodlands on north/south aligned ridges including Mt Todd. The shape matches closely with the local scale vegetation type: *E. tintinnans, C. dichromophloia* woodland (type 6).
12	1914.53	*E. tectifica, E. latifolia, E. tintinnans, E. spp*. woodland	Lower slopes and basins draining hills to the south of the site. The shape loosely matches with the local scale vegetation type *E. tectifica* woodland (type 9).
13*	1234.21	*E. phoenicea, Corymbia latifolia* low woodland – woodland (scattered *E. tintinnans*)	Hilly woodland west of Batman Pit. The shape matches closely with the local scale vegetation types: *E. tintinnans, E.. spp., Erythrophleum chlorostachys* woodland (type 4) and *E. tintinnans, C. dichromophloia* woodland (type 6)
16*	582.13	*Corymbia dichromophloia, Erythrophleum chlorostachys* woodland (scattered *E. tintinnans*)	Lower slopes and basins draining hills in east of site under TSF2. Matches a shape mapped as *E. tectifica* woodland (type 9).
38	32.97	*Corymbia latifolia, E. bigalerita* open woodland with areas of grassland	This area is in the area now part of the Batman Pit.

1:250,000 Vegetation Type	Area within MLNs (ha)	Wilson and Clark (1990) Regional Scale Description	Relationship to Local Scale Vegetation Types
50	34.08	Man-made clearings, infrastructure	Associated with what is now raw water dam in the north east of the site.
51*	113.08	*E. spp., Melaleuca spp., Lophostemon spp., Syzygium spp*. mixed species woodlands to open forest along watercourses, alluvial flats and creek lines	Associated with the drainage line in north east which is now under raw water dam and area of vegetation upstream which is a small area mapped at the local scale as *E. bigalerita, E. spp.* open forest (type 2).

*Denotes vegetation types where regional and local scale vegetation descriptions do not have equivalent dominant species.

The vegetation types that were not able to be confidently matched between the local (1:50,000) and regional mapping (1:250,000) are marked in Table 5-3 with an asterisk (*). In all cases the landscape position is congruent, however the dominant species are not. Based on field observation, the local scale vegetation type is the more accurate in describing what species are present however in order to present a regional context of proposed relative vegetation loss, the regional vegetation types are retained and are used in Table 5-4.

Table 5-4 describes relative losses of each vegetation type at the regional scale, in the context of vegetation types mapped at the 1:250,000 scale (Wilson and Clark 1990) within:

- The mapped area between Pine Creek and Katherine; and
- The Yinberrie Hills SOCS.

Regional Vegetation Representation Katherine to Pine Creek

In the area between Pine Creek and Katherine, Wilson and Clark identified and mapped 49 vegetation communities covering an area of 682,824ha. Table 5-4 shows the relative loss of the 1:250,000 vegetation types proposed by the Mt Todd gold project in the context of the representation of the vegetation types mapped between Katherine and Pine Creek.

Regional Vegetation Representation in Yinberrie Hills SOCS

The Yinberrie SOCS is an area identified by DLRM (formerly NRETAS) as a site of conservation significance extending roughly from the Nitmiluk National Park in the east, encompassing the Yinberrie Hills to the west. This area contains the Mt Todd mine and mineral leases. It covers an area of approximately 102,488ha (or approximately 15% of the area mapped between Katherine and Pine Creek). This area is not completely covered by the 1:250,000 scale vegetation mapping (Wilson and Clark 1990). The 1:250,000 scale mapping covers 90,294ha of the Yinberrie Hills SOCS, leaving an area of 12,194 ha or 11.9% of the Yinberrie Hills SOCS not covered by the 1:250,000 scale mapping.

Of the 49 vegetation types mapped at 1:250,000 scale, 24 occur in the Yinberrie Hills SOCS. Table 5-4 shows the potential relative loss of the 1:250,000 vegetation types proposed by the Mt Todd Gold Project in the context of the representation of the vegetation types mapped in the Yinberrie Hills SOCS.

The largest amount of clearing of any one vegetation type in the Yinberrie Hills SOCS is the proposed removal of 16.16% of *Corymbia dichromophloia, Erythrophleum chlorostachys* woodland (scattered *E. tintinnans*). This equates to 14% of this vegetation type within the Katherine to Pine Creek region.

All of the vegetation types to be cleared by the proposed Mt Todd Gold Project are represented in the Yinberrie Hills SOCS with more than 71% of each vegetation type remaining after the proposed clearing for the Mt Todd gold project.

5.1.1 Nationally and Regionally Significant Vegetation Communities

No nationally significant vegetation communities were recorded during this study.

Pine Creek Bioregion has a large proportion of its area (12133 km^2 or 42.64%) conserved in reserves, most notably Kakadu, Nitmiluk, Litchfield and Mary River National Parks (NRETA, 2005).

No ecosystems in the Pine Creek Bioregion are listed as threatened; however rainforest, riparian and wetland areas have been identified as being at risk due to impacts of feral animals, weeds, livestock or fire. Riparian woodlands in the mineral lease (VT1 and VT2) are therefore a locally significant community. Riparian vegetation provides a range of ecosystem services such as filtering contaminants and nutrients, providing habitat for flora and fauna and preventing soil erosion. Riparian woodlands in the mineral lease (vegetation type 1 and to a lesser extent vegetation type 2) are therefore valuable vegetation types.

There is potential for mining to have localised impacts on ecological values of the riparian vegetation of the Edith River. Altering the flow regime within the Edith River may also impact on the condition of riparian vegetation downstream of the mineral lease.

Table 5-4 Vegetation Losses in the Regional Context*

Regional Scale Vegetation Type Map Unit No.	Wilson and Clark (1990) Regional Scale Description	Area Removed for Mine	Area in Proposed Development Footprint (ha)	Vegetation in Yinberrie Hills SOCS		Vegetation in mapped area Katherine – Pine Creek	
				Area (ha)	% loss**	Area (ha)	% loss**
1	*Corymbia latifolia, E. bigalerita, Erythrophleum chlorostachys, E. spp*. open-forest	30.24	87.02	2354.56	3.68	3347.38	2.60
7***	*Erythrophleum chlorostachys, E. tintinnans, E. spp.* Woodland	0.13	0	1738.29	0	6368.67	0
10	*Corymbia dichromophloia, E. tintinnans, Erythrophleum chlorostachys* woodland	151.05	175.51	10312.78	1.70	40535.44	0.43
12	*E. tectifica, E. latifolia, E. tintinnans, E. spp*. woodland	544.36	521.68	27966.49	1.86	177699.14	0.29
13	*E. phoenicea, Corymbia latifolia* low woodland – woodland (scattered *E. tintinnans*)	47.73	60.56	24338.98	0.25	48601.92	0.13
16	*Corymbia dichromophloia, Erythrophleum chlorostachys* woodland (scattered *E. tintinnans*)	28.51	276.90	1713.59	16.16	1973.65	14.03
38***	*Corymbia latifolia, E. bigalerita* open woodland with areas of grassland	29.50	29.47	105.12	28.03	105.12	28.03
50***	Man made clearings, infrastructure	23.66	22.57	100.56	22.44	1436.52	1.57
51	*E. spp., Melaleuca spp., Lophostemon spp., Syzygium spp*. mixed species woodlands to open forest along watercourses, alluvial flats and creek lines	33.35	83.43	3076.47	2.71	41189.97	0.20

*Areas and percentages to 2 decimal places.

**Proposed loss of vegetation types based on the footprint of the Mt Todd Gold Project, with 1:250,000 scale map adjusted to include the current disturbance polygon.

***This vegetation type has been removed from the mineral lease during the period 1990-current as a consequence of the Batman Pit development.

5.2 Sensitive or Significant Vegetation Types (NT Land Clearing Guidelines)

The NT Land Clearing Guidelines stipulate the types of vegetation that are deemed 'sensitive' or 'significant'. These include riparian, rainforest and wetland areas. There is no rainforest, vine thicket or closed forest that would be removed by the proposed mining. Riparian vegetation proposed to be cleared includes 96.04 ha of vegetation type 2 which occurs on the clayey floodplains of the Edith River and various smaller creek lines throughout the study area.

The guidelines provide recommended buffer widths for vegetation to be retained along watercourses based on their order in the drainage system. The recommended buffer widths and their application to the mineral leases are detailed in Table 5-5.

Table 5-5 Recommended Buffer Widths of Land Clearing from Drainage Lines

Waterway	Stream Order	Min. Buffer Width (m)	Measured From	Example Features from Study Area	Mapped Vegetation Type Equivalent
Drainage areas	NA	25	Outer edge of seepage zone	Broad drainage lines through TSF2 Broad drainage line running south east from the current heap leach pad	11
Intermittent streams	First	25	Outer edge of riparian vegetation, where mapped otherwise the primary bank of the outer stream channel where there is more than one channel or the stream is braided		
Intermittent streams	Second	50	As above	West Creek	11
Creeks	Third and fourth	100	As above	Horseshoe Creek Batman Creek Burrell Creek Stow Creek	2, 11
Rivers	Fifth and sixth	250	As above	Edith River	1

If the buffer widths discussed in Table 5-5 are maintained no impact on the water dependent vegetation types (i.e. vegetation types 1, 2 and 11) is anticipated. If the buffer widths are compromised there is potential for impacts on water dependent vegetation types along drainage lines downstream of the proposed development.

The project occurs in the Daly River Catchment and Fergusson River sub-catchment. The land clearing guidelines specific to the Daly catchment and sub-catchments limit vegetation clearing to 40% of each major vegetation type in a sub-catchment, and 40% of all vegetation in any sub-catchment. The clearing proposed for this project does not constitute 40% of any major vegetation type or total vegetation in the Fergusson River sub-catchment.

5.3 Threatened Flora

The only species of threatened flora known or predicted to occur in or surrounding the mineral leases is *Utricularia singeriana*.

One area identified as potential *U. singeriana* habitat is shown in relation to the proposed development in Figure 4-4. The location is outside the proposed footprint of development. . If, as planned, no development occurs in the localised catchment of this area, it is unlikely that the proposed mining activity would impact on this species

5.4 Introduced Flora (Weeds)

Construction and operation of the proposed mine may result in the introduction of new weeds and spread of existing weeds around the MLNs.

Exotic grasses such as Gamba grass (*Andropogon gayanus*) and Mission grass (*Pennisetum polystachion*) pose a significant risk to the environment,-. These species increase fuel loads and pose a significant potential risk of fire. Wildfire in areas infested with these species can cause significant change in the species composition and structure of vegetation (including the tree layer) (NRETA 2007c; NRETAS 2008).

5.5 Dust

The robust sclerophyllous nature of the dominant plant species in the vegetation, and the long vertically hanging petioles of the dominant Eucalyptus and Corymbia tend to minimise impacts associated with the natural accumulation of dust in the dry season, thus minimising potential impacts associated with the proposed mine(Neinhuis and Barthlott 1998, Raupach et al., 2001). Levels of dust deposition would likely need to exceed 7 g m^{-2} before impact is anticipated (Farmer 1993, based on impact from high levels of cement dust).

Levels of predicted ground level dust concentration (24-hour PM_{10}) greater than the NSW Office of Environment and Heritage (OEH) criteria (DECC 2005) for Total Suspended Particles (TSP), of 50 ug/m^3 are predicted to encompass most of the Mineral Leases, extending well to the south and well outside the Mineral Leases to the west and northwest (GHD 2013).

The levels of deposition of dust suggest that impacts if any would be restricted to the area immediately adjacent to the Batman Pit.

6 Mitigation Measures

An Environmental Management Plan should be developed for the Project that incorporates the mitigation measures proposed below. Mitigation measures should be implements throughout the life of the project and be presented to contractors and staff through environmental inductions and later reinforced through regular toolbox meetings.

6.1 Vegetation

Removal of vegetation is essential to this development. There is no mitigation against vegetation loss associated with expansion of the Batman Pit, re-establishment and refurbishment of existing facilities, expansion of the existing waste rock dump and development of new associated infrastructure including the second Tailings Storage Facility (TSF2).

Vegetation clearance should be carried out in the dry season and should be staged in order to minimise areas exposed to wind and water erosion, to maintain ground cover and protect soil where practicable. The boundaries of all approved clearing should be clearly delineated to prevent encroachment into adjacent areas of vegetation. Areas not associated with the direct Project impact should be temporally fenced and marked as 'no-go' areas.

An erosion and sediment control plan (ESCP) should be developed prior to any clearing works and implemented throughout the construction process. Soil stabilisation should be implemented as soon as practicable during construction.

A revegetation plan should be prepared to guide the revegetation of areas temporarily or recently disturbed. This plan should focus on the establishment of native grasses as an immediate treatment of bare areas).

6.2 Threatened Flora

Little is known of the current threats to *U. singeriana.* It is thought to be vulnerable to trampling by feral animals and associated soil erosion, to weed invasion and stochastic events such as fire, and to alterations in the quality and quantity of water inundating its habitat (Woinarski *et al.* 2007).

Protection from impact on the potential *U. singeriana* habitat in the south of the mineral leases should involve restricting the proposed development to the current footprint. It is also recommended that potential habitat be fenced off and marked as a 'no go' zone to prevent any inadvertent damage to this area.

If the mine footprint changes and development is later proposed for this area, it is recommended that a late-wet season targeted survey be undertaken to check for *U. singeriana* in the area of identified potential habitat.

6.3 Introduced Flora

Introduced flora is moderately abundant around the existing mine site. Mitigation of the impact s of introduced flora associated with the redevelopment of the mine by Vista Gold should be based on the implementation of a weed management plan prior to and during mine construction

and operation, in order to control the spread of existing infestations of introduced flora, and the introduction to the project area of new species of introduced flora. A weed management should include the following:

- Protocols for the movement of people and machinery around the mine site and to and from the mine site;
- Management of soil stockpiles to prevent sediment and/or weed transfer into adjacent areas of vegetation;
- Management of water and sediment movement across the site;
- Protocols for sourcing soil and other earthen materials from offsite (where required);
- Vehicle washing and inspection protocols for vehicles coming onto the mine site;
- Quarantine for materials (e.g. clay imported to the site known or likely to contain seeds of introduced flora;
- Continuation of active weed control measure at the mine site; and
- Surveillance of the greater mine area for newly established infestations.

6.4 Dust

Standard dust mitigation should include:

- Use of water sprays;
- Chemical treatment of roads to reduce dust generation;
- Wetting of ore prior to crushing;
- Hooded crushers; and
- Enclosed HPRG (High Pressure Grinding Role).

7 Assessment of Significance of Impacts on Vegetation and Mitigation Measures

A number of sites within the Yinberrie Hills SOCS are included on the Register of the National Estate (RNE) for biological and ecological values. The significance of the impacts of this project are considered below in the context of the biological and ecological values that occur within the mineral leases (the mineral leases forming a small part of the Yinberrie Hills SOCS). Assessment of impact is measured using the SEWPaC Significant Impact Guidelines 1.1: Matters of National Environmental Significance (National Heritage Places with Natural Heritage Values: Biological and Ecological Values).

Level of risk, possible mitigation of risk and determination of residual risk to the biological and ecological values of the Yinberrie Hills SOCS was determined using standard qualitative risk assessment procedures (Table 7-1) (A/NZS 4360:2004). Level of likelihood and severity of consequences is defined in Table 7-2 and Table 7-3 respectively. Table 7-4 contains the assessment of significance of the Mt Todd Gold Project on the biological and ecological values contained within the mineral leases.

Table 7-1 Qualitative Risk Analysis Matrix

		Severity of Consequence				
		Critical (5)	**Major (4)**	**Significant (3)**	**Moderate (2)**	**Minor (1)**
Likelihood of Consequence	**Almost Certain (5)**	Extreme	Extreme	High	High	Medium
	Likely (4)	Extreme	High	High	Medium	Medium
	Possible (3)	Extreme	High	Medium	Medium	Low
	Unlikely (2)	High	Medium	Medium	Low	Very Low
	Rare (1)	Medium	Medium	Low	Low	Very Low

Table 7-2 Definition of Likelihood

Level of Likelihood	Definitions
Almost certain	The event is expected to occur in most circumstances (The event is likely to occur once per year).
Likely	The event will probably occur in most circumstances (The event is likely to occur once every 1 – 2 years).
Possible	The event might occur at some time (The event is likely to occur once every 2 – 5 years).
Unlikely	The event could occur at some time (The event is likely to occur once every 5 – 10 years).
Rare	The event may occur only in exceptional circumstances (The event is unlikely to occur in any to year period).

Table 7-3 Definitions of Consequence

Levels of Consequence	Definitions*
Critical	Extensive long term environmental harm and/or harm that is extremely widespread. Impacts unlikely to be reversible within 10 years.
Major	Major or widespread, unplanned environmental impact on or off the site. Significant resources required to respond and rehabilitate.
Significant	Significant, unplanned environmental impact contained within the site or minor impact that is off the site.
Moderate	Moderate, unplanned localised environmental impact (maybe of a temporary nature) or discharge contained on-site or with negligible off-site impact.
Minor	Minor environmental impact. Any impacts are contained on-site and short term in nature. No detrimental effect on the environment.

The questions asked in each case were as follows:

- What was the likelihood of source of impact (e.g. land clearing) causing a particular consequence (e.g. reduce the diversity or modify the composition of plant and animal species in a National Heritage place), and
- What was the severity of the consequence if it occurred, with the resulting level of residual risk determining whether the particular consequence was significant in terms of the EPBC Guidelines.

The assessment of significance presented in Table 7-4 concludes that the proposed impacts of the Mt Todd Gold Project present no risk above 'Medium'. The mitigation measures presented in the table are thought adequate to prevent any significant impacts on the biological and ecological values of the mineral leases and therefore the Yinberrie Hills SOCS.

Table 7-4 Assessment of Significance of impact of the Mt Todd Gold Project on the Ecological and Biological Values of the Mineral Leases

An action is likely to have a significant impact on natural heritage values of a National Heritage place if there is a real chance or possibility that the action will:

Source of Risk	Mitigation Measures	Consequence	Likelihood	Residual Risk
Modify or inhibit ecological processes in a National Heritage place				
Vegetation clearance in buffer zones recommended by NT Land Clearing Guidelines	Adhere to buffer widths recommended by the NT Land Clearing Guidelines with regard to riparian vegetation in drainage lines. If not possible (i.e. in the case of TSF2) install structures that would capture sediment downstream of development. Stage clearing of vegetation to minimise areas of bare ground and clear land only as required and in accordance with ESCP. Avoid land clearing for construction during the wet season (Dec-May).	Moderate	Possible	Medium
Over clearing of vegetation	Prepare vegetation clearing plans which include areas not to be cleared (no-go areas) and make all workers aware of them through Environmental Management Plans (EMPs) and site work briefings.	Minor	Likely	Medium
Introduction and/or spread of weed species	Develop and implement a weed management plan to prevent weeds being introduced and/or spread during construction and operation.	Moderate	Possible	Medium
Elevated levels of dust from mining operations	Chemically treat haul roads to minimise dust emissions, use water sprays on haul roads, and loads, wetting of ore before crushing, use hooded crushers and enclosed HPGR's.	Significant	Possible	Medium
Reduce the diversity or modify the composition of plant and animal species in a National Heritage place				
Vegetation clearance in buffer zones recommended by NT Land Clearing Guidelines	Adhere to buffer widths recommended by the NT Land Clearing Guidelines with regard to riparian zones vegetation in drainage lines. If not possible with regard to drainage lines (i.e. in the case of TSF2) install structures that would mechanism to capture sediment downstream of development. Stage clearing of vegetation to minimise areas of bare ground and clear land only as required and in accordance with ESCP. Avoid land clearing for construction during the wet season (Dec-May).	Moderate	Possible	Medium
Over clearing of vegetation	Prepare vegetation clearing plans which include areas not to be cleared (no-go areas) and make all workers aware of them through Environmental Management Plans (EMPs) and site work briefings.	Minor	Possible	Low

Source of Risk	Mitigation Measures	Consequence	Likelihood	Residual Risk
Introduction and/or spread of weed species	Develop and implement a weed management plan to prevent weeds being introduced and/or spread during construction and operation.	Moderate	Possible	Medium
Elevated levels of dust from mining operations	Chemically treat haul roads to minimise dust emissions, use water sprays on haul roads, and loads, wet ore before crushing, use hooded crushers and enclosed HPGR's.	Significant	Possible	Medium
Fragment or damage habitat important for the conservation of biological diversity in a National Heritage place				
Vegetation clearance in buffer zones recommended by NT Land Clearing Guidelines	Respect buffer widths recommended by the NT Land Clearing Guidelines with regard to riparian zones. If not possible with regard to drainage lines (i.e. in the case of TSF2) install mechanism to capture sediment downstream of development. Stage clearing and clear land only as required. Avoid land clearing for construction during the wet season (Dec-May).	Moderate	Possible	Medium
Over clearing of vegetation	Prepare vegetation clearing plans which include areas not to be cleared (no-go areas) and make all workers aware of them through Environmental Management Plans (EMPs) and site work briefings. Fence of areas of potential habitat for *U. singeriana* and clearly mark as no go zone'. This should be done in consultation with a qualified ecologist who can help delineate the extent of potential habitat.	Minor	Possible	Medium
Introduction of weed species	Introduce weed control protocol to prevent weeds being brought onto site by vehicles during construction and operation. Extend protocol to control weeds being transferred from one part of the site to another during construction. Prepare Weed Management Plan and make all workers aware of procedures.	Moderate	Possible	Medium
Elevated levels of dust from mining operations	Chemically treat haul roads to minimise dust emissions, use water sprays on haul roads, and loads, wet ore before crushing, use hooded crushers and enclosed HPGR's.	Significant	Possible	Medium
Cause a long-term reduction in rare, endemic or unique plant or animal populations or species in a National Heritage place				
Clearing of individuals or habitat loss for *U. singeriana*: a threatened species known from the Yinberrie SOCS	Fence of areas of potential habitat for *U. singeriana* and clearly mark as no go zone'. This should be done in consultation with a qualified ecologist who can help delineate the extent of potential habitat.	Moderate	Unlikely	Low

Source of Risk	Mitigation Measures	Consequence	Likelihood	Residual Risk
Clearing of individuals or habitat loss for *Fimbristylis fimbristyloides*: a species endemic to the Yinberrie SOCS	Species detected during field surveys in woodland north of the existing Batman Pit. This area is not within the proposed clearing footprint and is 500 m from the nearest proposed works. Avoid clearing this location and if future clearing is proposed, undertake a targeted species survey and fence of area where this species occurs.	Moderate	Unlikely	Low
Elevated levels of dust from mining operations	Chemically treat haul roads to minimise dust emissions, use water sprays on haul roads, and loads, wet ore before crushing, use hooded crushers and enclosed HPGR's.	Significant	Possible	Medium
Fragment, isolate or substantially damage habitat for rare, endemic or unique plant or animal populations or species in a National Heritage place				
Clearing of individuals of or habitat loss for *U. singeriana*: a threatened species known from the Yinberrie SOCS	Species was not detected during field surveys and no records exist from within the mineral leases. Area of marginal potential habitat identified in south west of mineral leases adjacent to road to Edith River. This area is not within the proposed clearing footprint and is 1km from the nearest proposed works. Avoid clearing this location and if future clearing is proposed, undertake a targeted species survey in March.	Moderate	Unlikely	Low
Clearing of individuals of or habitat loss for *Fimbristylis fimbristyloides*: a species endemic to the Yinberrie SOCS	Species detected during field surveys in woodland north of the existing Batman Pit. This area is not within the proposed clearing footprint and is 500 m from the nearest proposed works. Avoid clearing this location and if future clearing is proposed, undertake a targeted species survey. Habitat within which this species was found is well represented within the mineral leases. Fence off areas of potential habitat for *U. singeriana* and clearly mark as no go zone. This should be done in consultation with a qualified ecologist who can help delineate the extent of potential habitat.	Moderate	Unlikely	Low
Elevated levels of dust from mining operations	Chemically treat haul roads to minimise dust emissions, use water sprays on haul roads, and loads, wetting of ore before crushing, use hooded crushers and enclosed HPGR's.	Significant	Possible	Medium

8 Conclusion

Vista Gold Australia Pty Ltd (Vista Gold) is proposing to re-establish and operate the Mt Todd Gold Mine, located approximately 55km north-west of Katherine, Northern Territory (NT).

The Mt Todd Gold Project (Project) will include the mining of gold from the existing Mt Todd Gold Mine - Batman Pit (previously mined and now in care and maintenance).

This report satisfies the requirements of the EIS Guidelines relating to flora and vegetation on the mine site area in the mining leases.

Review of existing information on the flora and vegetation of the Mt Todd area and subsequent field survey and analysis allowed for the following conclusions:

- The existing vegetation mapping by Wilson and Clark (1990) is largely adequate and accurate in describing the vegetation of the mineral leases. This Project made small modifications to the boundaries between the vegetation types using high quality, recent imagery and captures the footprint of disturbance from mining activity that occurred after Wilson and Clark's mapping;
- This survey identified 238 taxa, of which 71 were not previously recorded on the DLRM (formerly NRETAS) or Wilson and Clark (1990) lists. The total number of species known from the area is now 962. GHD identified 12 introduced taxa on the mineral leases;
- The footprint of the Mt Todd Gold Project will cover and area of 1267.13 ha. Of this:
  - 608.72 ha is remnant non-disturbed vegetation;
  - 28.83 ha is degraded (or modified) vegetation; and
  - 629.58 ha is cleared land.
- The maximum area to be removed by the Project of any one type is 294.83 ha (vegetation type 9: *Eucalyptus tectifica* woodland) which equates to a loss of 14.11 % of the 1990 extent within the mineral leases. The proposed clearing would result in a cumulative loss of 39.29 % of this vegetation type within the mineral leases based on the pre-1990 extent;
- All the area's vegetation types are well represented at the local scale within the mineral leases and the broader vegetation polygons are well represented in the region;
- The *E. tintinnans* woodlands of the mineral leases (vegetation types 4 and 6), well known as maintaining a significant breeding population of the Gouldian finch, were reduced by mining activity during the period 1990 – current by 6.07% and 8.70% respectively. The proposed clearing for the Mt Todd Gold Project will lead to a removal of a further 3.75% and 11.50% respectively based on the pre-1990 extent;
- The structural and floristic characteristics of the areas of *E. tintinnans* woodland to be cleared are not significantly different from those of the vegetation type in other areas of the mineral leases;
- A known population of the threatened *U. singeriana* was not in evidence at the time of the surveys. Habitat similar to that at the *U. singeriana* locations was found on the mineral leases. No specimens were located; and

- Three flora species declared as weed under the Weeds Management Act 2001 were observed in the mineral leases during GHD surveys. Flora records of the area contain eight declared weed species (including these three). Areas away from the disturbed mine site exhibited limited weed infestation.

9 References

BOM (2011). Climate Statistics for Australian Locations: Katherine Aviation Museum http://www.bom.gov.au/climate/averages/tables/cw_014903.shtml

Brock J. (2001). Native Plants of Northern Australia. Reed New Holland Australia Pty. Ltd.

Brocklehurst P., Lewis D., Napier D. and Lynch D. (2007). *Northern Territory Guidelines and Field Methodology for Vegetation Survey and Mapping*. Technical Report No. 02/2007D. Department of Natural Resources, Environment and the Arts, Palmerston, Northern Territory.

Cowie I.D. (2010). Short Communication: Notes on the identity, distribution and conservation status of the threatened plant species *Utricularia singeriana* F.Muell. (Lentibulariaceae). *The Beagle, Records of the Museums and Art Galleries of the Northern Territory, 2010* **26**: 119-121.

CSIRO (2006). *Euclid – Eucalypts of Australia*. 3rd edn. Centre for Plant Biodiversity Research. CSIRO Publishing.

DEWHA (2009). Matters of National Environmental Significance: Significant Impact Guidelines 1.1: Environment Protection and Biodiversity Act 1999. Department of the Environment, Water, Heritage the Arts and Sport. Commonwealth of Australia. http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf

Earth Sea Heritage Surveys (2013). Archaeological and Heritage Assessment of the Mt Todd Gold Project, ML1070, ML1071 and ML1127, Mt Todd, Northern Territory.

Farmer, A. M. (1993). The effects of dusts on vegetation – a review. *Environmental Pollution Series A*. **79**: 63-75.

GHD (2013). Mt Todd Gold Project. Air Quality Assessment. Prepared for Vista Gold Australia Pty Ltd, 2013.

O'Malley, C. (2006). *National recovery plan for the Gouldian finch* (Erythrura gouldiae). WWF Australia, Sydney, and Parks and Wildlife Commission of the Northern Territory, Palmerston, NT.

Maslin B. (2001). *Wattle – Acacias of Australia*. ABRS Identification Series. CSIRO PUBLISHING / Australian Biological Resources Study (ABRS) / Department of Conservation and Land Management (CALM) Western Australia.

Neinhuis, C., and W. Barthlott. (1998). Seasonal changes of leaf surface contamination in beech, oak and ginko in relation to leaf micromorphology and wettability. *New Phytologist* 138:91-98.

NRETA (2005).*Northern Territory Parks and Conservation Masterplan*, *Conservation Values and Environmental Resources* Department of Natural Resources, Environment and the Arts (NRETA), Northern Territory Government.

NRETA (2007a). Weeds. The Conservation Threat of Weeds in Savanna Woodlands. Department of Natural Resources, Environment and the Arts (NRETA), Northern Territory Government. http://www.nt.gov.au/nreta/wildlife/programs/threats/weeds.html

NRETA (2007b). Sites of Conservation Significance: Yinberrie Hills. Department of Natural Resources, Environment and the Arts (NRETA), Northern Territory Government. http://www.nt.gov.au/nreta/environment/conservation/map.html

NRETA (2007c). Land Management Control Methods. Department of Natural Resources, Environment and the Arts. Northern Territory Government. http://www.nt.gov.au/nreta/natres/weeds/controls/land/

NRETAS (2008). Gamba Grass: *Andropogon gayanus*. Department of Natural Resources, Environment, the Arts and Sport. Northern Territory Government. http://www.nt.gov.au/nreta/natres/weeds/ntweeds/gamba/pdf/GambaGrassWeednote.pdf

NRETAS (2010). Land Clearing Guidelines: Northern Territory Planning Scheme. Northern Territory Department of Natural Resources, Environment, the Arts and Sport.

Raupach, M. R., N. Woods, G. Dort, J. F. Leys and H. A. Cleugh. (2001). The entrapment of particles by windbreaks. *Atmospheric Environment* 35:3373-3383.

Sharp D. and Simon B.K. (2002). AusGrass: Grasses of Australia. Australian Biological Resources Study (ABRS) / Environment Protection Agency (EPA) Brisbane. CSIRO Publishing, Victoria.

Short P.S., Albrecht D.E., Cowie I.D., Lewis D.L. and Stuckey B.M. (eds) (2011). Checklist of the Vascular Plants of the Northern Territory. Northern Territory Herbarium, Department of Natural Resources, Environment, the Arts and Sport.

Smith N. (2002). *Weeds of the Wet/Dry Tropics of Australia – A field guide*. Environment Centre of the Northern Territory Inc. Darwin.

Tetra Tech (2011). 10.65 *Mtpy Preliminary Feasibility Study NI 43-101 Technical Report Mt. Todd Gold Project* prepared for Vista Gold Corp.

Wheeler J.R. (ed), Rye B.L., Koch B.L. and Wilson A.J.G. (1992). Flora of the Kimberley Region. Department of Conservation and Land Management, Western Australia.

Wilson B. A. and Clark M. J. (1990). *The Vegetation of an Area Surrounding the Proposed Batman Mine Site, Edith River, Northern Territory*. Technical Memorandum 90/4. Land Conservation Unit, Conservation Commission of the Northern Territory, Palmerston, NT.

Woinarski J., Pavey C., Kerrigan R., Cowie I. and Ward S. (2007). *Lost From Our Landscape: Threatened Species of the Northern Territory*. Northern Territory Government, Palmerston, NT.

Appendix A

Mine Site Flora List

From NT Government flora records, Wilson and Clark (1990) and GHD survey

				GHD Survey	
Family	**Species**	**NT Herbarium**	**Wilson & Clark (1990)**	**Dry Season**	**Wet Season**
ACANTHACEAE	*Dicliptera armata*	✓		✓	✓
ACANTHACEAE	*Hygrophila angustifolia*	✓			
ACANTHACEAE	*Nelsonia campestris*	✓			
ACANTHACEAE	*Pseuderanthemum variabile*	✓			
ACANTHACEAE	*Rostellularia adscendens subsp. clementii*	✓			
ACANTHACEAE	*Rostellularia adscendens subsp. indeterminate*	✓			✓
AIZOACEAE	*Trianthema rhynchocalyptra*	✓			
ALISMATACEAE	*Caldesia oligococca var. oligococca*	✓			
AMARANTHACEAE	*Alternanthera angustifolia var. lanata*	✓			
AMARANTHACEAE	*Alternanthera denticulata*				✓
AMARANTHACEAE	*Alternanthera nodiflora*	✓	✓		
AMARANTHACEAE	*Amaranthus pallidiflorus*	✓			
AMARANTHACEAE	*Gomphrena affinis subsp. affinis*	✓			
AMARANTHACEAE	*Gomphrena canescens*		✓		
AMARANTHACEAE	*Gomphrena canescens subsp. canescens*	✓			
AMARANTHACEAE	*Gomphrena canescens subsp. indeterminate*	✓			
AMARANTHACEAE	*Gomphrena flaccida*	✓			
AMARANTHACEAE	*Gomphrena floribunda*	✓			
AMARANTHACEAE	*Gomphrena involucrata*	✓			
AMARANTHACEAE	*Gomphrena lacinulata*	✓			
AMARANTHACEAE	*Gomphrena magentitepala*	✓			
AMARANTHACEAE	*Gomphrena parviflora*	✓			
AMARANTHACEAE	*Gomphrena rosula*	✓			
AMARANTHACEAE	*Gomphrena sp.*	✓			
AMARANTHACEAE	*Ptilotus corymbosus*	✓	✓		✓
AMARANTHACEAE	*Ptilotus distans*	✓			
AMARYLLIDACEAE	*Crinum angustifolium*	✓	✓		
AMARYLLIDACEAE	*Crinum uniflorum*	✓			
ANACARDIACEAE	*Blepharocarya depauperata*	✓	✓		
ANACARDIACEAE	*Buchanania obovata*	✓	✓	✓	✓

APOCYNACEAE	*Calotropis procera*				✓	
APOCYNACEAE	*Carissa lanceolata*	✓			✓	
APOCYNACEAE	*Gymnanthera oblonga*	✓				
APOCYNACEAE	*Hoya australis subsp. rupicola*	✓				
APOCYNACEAE	*Marsdenia trinervis*	✓				
APOCYNACEAE	*Marsdenia viridiflora subsp. tropica*	✓				✓
APOCYNACEAE	*Parsonsia velutina*	✓				
APOCYNACEAE	*Sarcostemma viminale subsp. brunonianum*	✓				
APOCYNACEAE	*Wrightia pubescens*		✓			
APOCYNACEAE	*Wrightia saligna*	✓	✓		✓	
AQUIFOLIACEAE	*Ilex arnhemensis subsp. arnhemensis*	✓				
ARALIACEAE	*Trachymene didiscoides*	✓				
ASPARAGACEAE	*Chlorophytum laxum*	✓				
ASPARAGACEAE	*Lomandra tropica subsp. indeterminate*	✓				
ASPARAGACEAE	*Thysanotus chinensis*	✓				
ASTERACEAE	*Aster sp.*	✓				
ASTERACEAE	*Bidens bipinnata*	✓				
ASTERACEAE	*Bidens pilosa*	✓				
ASTERACEAE	*Blumea diffusa*	✓				
ASTERACEAE	*Blumea integrifolia*	✓				✓
ASTERACEAE	*Blumea psammophila*	✓				
ASTERACEAE	*Blumea saxatilis*	✓	✓		✓	
ASTERACEAE	*Centipeda minima subsp. indeterminate*	✓				
ASTERACEAE	*Minuria macrorhiza*	✓			✓	
ASTERACEAE	*Minuria sp.*	✓				
ASTERACEAE	*Pleurocarpaea denticulata*	✓	✓			
ASTERACEAE	*Pterocaulon globuliflorus*	✓				
ASTERACEAE	*Pterocaulon niveum*	✓				
ASTERACEAE	*Pterocaulon serrulatum var. indeterminate*	✓				
ASTERACEAE	*Pterocaulon serrulatum var. velutinum*	✓				
ASTERACEAE	*Pterocaulon sp.*	✓				
ASTERACEAE	*Pterocaulon sp. 1*				✓	
ASTERACEAE	*Pterocaulon sp. 2*				✓	

ASTERACEAE	*Pterocaulon verbascifolium*	✓				
ASTERACEAE	*Sphaeromorphaea australis*	✓				
BIGNONIACEAE	*Dolichandrone filiformis*	✓	✓		✓	
BIGNONIACEAE	*Dolichandrone heterophylla*	✓				
BIXACEAE	*Cochlospermum fraseri*				✓	✓
BIXACEAE	*Cochlospermum fraseri subsp. fraseri*	✓				
BIXACEAE	*Cochlospermum fraseri subsp. heteronemum*	✓				
BIXACEAE	*Cochlospermum fraseri subsp. indeterminate*	✓				
BORAGINACEAE	*Ehretia saligna var. indeterminate*	✓				
BORAGINACEAE	*Heliotropium alcyonium*	✓				
BORAGINACEAE	*Heliotropium amnis-edith*	✓				
BORAGINACEAE	*Heliotropium bracteatum*	✓				
BORAGINACEAE	*Heliotropium foliatum*	✓				
BORAGINACEAE	*Heliotropium ventricosum*	✓	✓		✓	✓
BURMANNIACEAE	*Burmannia coelestis*	✓				
BURMANNIACEAE	*Burmannia juncea*	✓				
BURSERACEAE	*Canarium australianum*	✓				
BYBLIDACEAE	*Byblis aquatica*	✓				
BYBLIDACEAE	*Byblis liniflora*	✓				
CAPPARACEAE	*Capparis lasiantha*					✓
CAPPARACEAE	*Capparis umbonata*	✓				
CARYOPHYLLACEAE	*Polycarpaea breviflora*	✓				
CARYOPHYLLACEAE	*Polycarpaea corymbosa*	✓				
CARYOPHYLLACEAE	*Polycarpaea holtzei*	✓				
CARYOPHYLLACEAE	*Polycarpaea longiflora*	✓				
CARYOPHYLLACEAE	*Polycarpaea sp.*	✓				
CARYOPHYLLACEAE	*Polycarpaea spirostylis*	✓				
CARYOPHYLLACEAE	*Polycarpaea staminodina*	✓				
CARYOPHYLLACEAE	*Polycarpaea violacea*	✓				
CELASTRACEAE	*Stackhousia intermedia*	✓			✓	
CENTROLEPIDACEAE	*Centrolepis curta*	✓				
CENTROLEPIDACEAE	*Centrolepis exserta*	✓				
CENTROLEPIDACEAE	*Centrolepis sp. carinate (L.A.Craven & C.R.Dunlop 666*	✓				

CLEOMACEAE	*Cleome tetrandra var. indeterminate*	✓	✓			
CLEOMACEAE	*Cleome viscosa*	✓	✓			
COLCHICACEAE	*Iphigenia indica*	✓				
COMBRETACEAE	*Terminalia canescens*	✓				
COMBRETACEAE	*Terminalia carpentariae*	✓				✓
COMBRETACEAE	*Terminalia ferdinandiana*	✓	✓			✓
COMBRETACEAE	*Terminalia ferdinandiana*				✓	✓
COMBRETACEAE	*Terminalia grandiflora*				✓	
COMBRETACEAE	*Terminalia grandiflora*	✓				
COMBRETACEAE	*Terminalia platyphylla*	✓	✓			✓
COMBRETACEAE	*Terminalia platyptera*	✓				
COMBRETACEAE	*Terminalia pterocarya*	✓	✓			✓
COMBRETACEAE	*Terminalia sp.*	✓				
COMMELINACEAE	*Aneilema siliculosum*	✓				
COMMELINACEAE	*Cartonema parviflorum*	✓				
COMMELINACEAE	*Cartonema sp.*	✓				
COMMELINACEAE	*Cartonema spicatum*	✓	✓			✓
COMMELINACEAE	*Cartonema tenue*	✓				
COMMELINACEAE	*Cartonema trigonospermum*	✓				
COMMELINACEAE	*Commelina difformis*					✓
COMMELINACEAE	*Commelina ensifolia*	✓				
COMMELINACEAE	*Cyanotis axillaris*	✓				
COMMELINACEAE	*Murdannia gigantea*	✓				
COMMELINACEAE	*Murdannia graminea*	✓	✓			✓
COMMELINACEAE	*Murdannia sp.*	✓				
CONVOLVULACEAE	*Bonamia pannosa*	✓				
CONVOLVULACEAE	*Convolvulus sp.*					✓
CONVOLVULACEAE	*Evolvulus alsinoides*		✓			
CONVOLVULACEAE	*Evolvulus alsinoides var. indeterminate*	✓				
CONVOLVULACEAE	*Ipomoea diversifolia*	✓				✓
CONVOLVULACEAE	*Ipomoea eriocarpa*	✓	✓		✓	
CONVOLVULACEAE	*Ipomoea gracilis*	✓	✓			
CONVOLVULACEAE	*Ipomoea graminea*	✓				✓

CONVOLVULACEAE	*Ipomoea sp.*	✓				
CONVOLVULACEAE	*Jacquemontia browniana*	✓				
CONVOLVULACEAE	*Jacquemontia sp. Douglas Daly (C.R.Michell 1124)*	✓				
CONVOLVULACEAE	*Polymeria ambigua*	✓	✓			
CONVOLVULACEAE	*Xenostegia tridentata*	✓	✓			
CUCURBITACEAE	*Cucumis melo subsp. indeterminate*	✓				✓
CUPPRESSACEAE	*Callitris intratropica*				✓	
CYPERACEAE	*Arthrostylis aphylla*	✓				
CYPERACEAE	*Bulbostylis barbata*	✓	✓			
CYPERACEAE	*Crosslandia setifolia*	✓				
CYPERACEAE	*Cyperus aquatilis*	✓				
CYPERACEAE	*Cyperus breviculmis*	✓				
CYPERACEAE	*Cyperus castaneus*	✓				
CYPERACEAE	*Cyperus cristulatus*	✓				
CYPERACEAE	*Cyperus cunninghamii subsp. uniflorus*	✓				
CYPERACEAE	*Cyperus haspan subsp. haspan*	✓				
CYPERACEAE	*Cyperus haspan subsp. indeterminate*	✓				
CYPERACEAE	*Cyperus holoschoenus*	✓				
CYPERACEAE	*Cyperus javanicus subsp. armstrongii*	✓	✓			
CYPERACEAE	*Cyperus macrostachyos*	✓				
CYPERACEAE	*Cyperus microcephalus subsp. indeterminate*	✓				
CYPERACEAE	*Cyperus microcephalus subsp. microcephalus*	✓				
CYPERACEAE	*Cyperus microcephalus subsp. saxicola*	✓				
CYPERACEAE	*Cyperus nervulosus*	✓				
CYPERACEAE	*Cyperus orgadophilus*	✓				
CYPERACEAE	*Cyperus portae-tartari*	✓				
CYPERACEAE	*Cyperus pulchellus*	✓			✓	
CYPERACEAE	*Cyperus sexflorus*	✓				
CYPERACEAE	*Cyperus sp.*	✓				✓
CYPERACEAE	*Cyperus sp. BW 170*		✓			
CYPERACEAE	*Cyperus sp. Edith River (M.Lazarides 124)*	✓				
CYPERACEAE	*Cyperus sporobolus*	✓				
CYPERACEAE	*Cyperus tenuispica*	✓				

CYPERACEAE	*Cyperus viscidulus*	✓				
CYPERACEAE	*Eleocharis caespitosissima*	✓				
CYPERACEAE	*Eleocharis setifolia*	✓				
CYPERACEAE	*Eleocharis sp. Nourlangie Creek (L.A.Craven 4652)*	✓				
CYPERACEAE	*Fimbristylis 5*		✓			
CYPERACEAE	*Fimbristylis acuminata*	✓				
CYPERACEAE	*Fimbristylis caloptera*	✓				
CYPERACEAE	*Fimbristylis cardiocarpa*	✓				
CYPERACEAE	*Fimbristylis cinnamometorum*	✓	✓			✓
CYPERACEAE	*Fimbristylis composita*	✓				
CYPERACEAE	*Fimbristylis densa*	✓	✓			
CYPERACEAE	*Fimbristylis depauperata*	✓				
CYPERACEAE	*Fimbristylis fimbristyloides*	✓				✓
CYPERACEAE	*Fimbristylis furva*	✓				
CYPERACEAE	*Fimbristylis lanceolata*	✓				
CYPERACEAE	*Fimbristylis littoralis var. littoralis*	✓	✓			
CYPERACEAE	*Fimbristylis macassarensis*	✓				
CYPERACEAE	*Fimbristylis macrantha*	✓				
CYPERACEAE	*Fimbristylis microcarya*	✓				✓
CYPERACEAE	*Fimbristylis miliacea*	✓				
CYPERACEAE	*Fimbristylis nuda*	✓				
CYPERACEAE	*Fimbristylis nutans*	✓				
CYPERACEAE	*Fimbristylis ovata*	✓				
CYPERACEAE	*Fimbristylis oxystachya*	✓	✓			
CYPERACEAE	*Fimbristylis pachyptera*	✓				
CYPERACEAE	*Fimbristylis pallida*	✓				
CYPERACEAE	*Fimbristylis pauciflora*	✓	✓			✓
CYPERACEAE	*Fimbristylis pilifera*	✓				
CYPERACEAE	*Fimbristylis pterygosperma*	✓				
CYPERACEAE	*Fimbristylis punctata*	✓				
CYPERACEAE	*Fimbristylis rupestris*	✓				
CYPERACEAE	*Fimbristylis schultzii*	✓				
CYPERACEAE	*Fimbristylis signata*	✓				

CYPERACEAE	*Fimbristylis simplex*	✓	✓		✓
CYPERACEAE	*Fimbristylis simulans*	✓			
CYPERACEAE	*Fimbristylis sp.*	✓		✓	
CYPERACEAE	*Fimbristylis sp. Charles Darwin (J.L.Egan 5300)*	✓			
CYPERACEAE	*Fimbristylis sp. Howard River (P.G.Wilson 10719)*	✓			
CYPERACEAE	*Fimbristylis sp. Minute (C.R.Michell 2352)*	✓			
CYPERACEAE	*Fimbristylis sphaerocephala*	✓			
CYPERACEAE	*Fimbristylis squarrulosa*	✓			
CYPERACEAE	*Fimbristylis tetragona*	✓			
CYPERACEAE	*Fimbristylis trachycarya*	✓			
CYPERACEAE	*Fimbristylis trigastrocarya*	✓			
CYPERACEAE	*Fimbristylis tristachya*	✓			
CYPERACEAE	*Fimbristylis xyridis*	✓			
CYPERACEAE	*Fuirena ciliaris*	✓		✓	
CYPERACEAE	*Fuirena nudiflora*	✓			
CYPERACEAE	*Fuirena umbellata*	✓			
CYPERACEAE	*Isolepis humillima*	✓			
CYPERACEAE	*Lipocarpha microcephala*	✓			
CYPERACEAE	*Rhynchospora exserta*	✓			
CYPERACEAE	*Rhynchospora heterochaeta*	✓			
CYPERACEAE	*Rhynchospora longisetis*	✓			
CYPERACEAE	*Rhynchospora pterochaeta*	✓			
CYPERACEAE	*Rhynchospora rubra*	✓			
CYPERACEAE	*Rhynchospora sp.*	✓		✓	
CYPERACEAE	*Rhynchospora subtenuifolia*	✓			
CYPERACEAE	*Schoenus punctatus*	✓			
CYPERACEAE	*Scleria biflora subsp. indeterminate*	✓			
CYPERACEAE	*Scleria brownii*	✓	✓		
CYPERACEAE	*Scleria lingulata*	✓			
CYPERACEAE	*Scleria novae-hollandiae*	✓	✓		
CYPERACEAE	*Scleria pergracilis*	✓			
CYPERACEAE	*Scleria pygmaea*	✓			
CYPERACEAE	*Scleria rugosa*	✓			

CYPERACEAE	*Scleria sp.*	✓			
CYPERACEAE	*Scleria sphacelata*	✓		✓	✓
CYPERACEAE	*Tricostularia undulata*	✓			
DILLENIACEAE	*Hibbertia auriculiflora subsp. indeterminate*	✓			
DILLENIACEAE	*Hibbertia cactifolia*	✓			
DILLENIACEAE	*Hibbertia candicans*	✓			
DILLENIACEAE	*Hibbertia ciliolata*	✓			
DILLENIACEAE	*Hibbertia dilatata*	✓			
DILLENIACEAE	*Hibbertia haplostemona*	✓			
DILLENIACEAE	*Hibbertia juncea*	✓			
DILLENIACEAE	*Hibbertia lepidota*	✓			
DILLENIACEAE	*Hibbertia oblongata subsp. indeterminate*	✓			
DILLENIACEAE	*Hibbertia orbicularis*	✓			
DILLENIACEAE	*Hibbertia sphenandra*	✓			
DILLENIACEAE	*Hibbertia tomentosa*	✓			
DILLENIACEAE	*Pachynema complanatum*		✓		
DIOSCOREACEAE	*Dioscorea transversa*				✓
DROSERACEAE	*Drosera burmanni*	✓			
DROSERACEAE	*Drosera dilatatopetiolaris*	✓			
DROSERACEAE	*Drosera falconeri*	✓			
DROSERACEAE	*Drosera indica*				✓
DROSERACEAE	*Drosera indica*	✓		✓	
DROSERACEAE	*Drosera lanata*	✓			
DROSERACEAE	*Drosera petiolaris*	✓	✓		✓
DROSERACEAE	*Drosera sp.*	✓			
ELATINACEAE	*Bergia pedicellaris*	✓			
ELATINACEAE	*Bergia pusilla*	✓			
ERIOCAULACEAE	*Eriocaulon cinereum*	✓			
ERIOCAULACEAE	*Eriocaulon concretum*	✓			
ERIOCAULACEAE	*Eriocaulon pusillum*	✓			
ERIOCAULACEAE	*Eriocaulon setaceum*	✓			
ERIOCAULACEAE	*Eriocaulon sp.*	✓		✓	
ERIOCAULACEAE	*Eriocaulon spectabile*	✓			

ERYTHROXYLACEAE	*Erythroxylum ellipticum*	✓	✓			
EUPHORBIACEAE	*Calycopeplus collinus*	✓				
EUPHORBIACEAE	*Croton arnhemicus*	✓	✓			✓
EUPHORBIACEAE	*Euphorbia armstrongiana*	✓				✓
EUPHORBIACEAE	*Euphorbia hirta*					✓
EUPHORBIACEAE	*Euphorbia mitchelliana*	✓				
EUPHORBIACEAE	*Euphorbia muelleri*	✓				✓
EUPHORBIACEAE	*Euphorbia schultzii*	✓	✓		✓	
EUPHORBIACEAE	*Euphorbia sp.*	✓				
EUPHORBIACEAE	*Euphorbia tannensis subsp. indeterminate*	✓				✓
EUPHORBIACEAE	*Euphorbia valchellii*					✓
EUPHORBIACEAE	*Jatropha sp.*		✓			
EUPHORBIACEAE	*Sebastiania chamaelea*	✓				
FABACEAE	*Abrus precatorius subsp. precatorius*	✓				
FABACEAE	*Acacia alleniana*	✓				
FABACEAE	*Acacia auriculiformis*	✓				✓
FABACEAE	*Acacia cataractae*	✓				
FABACEAE	*Acacia difficilis*	✓				
FABACEAE	*Acacia dimidiata*	✓				
FABACEAE	*Acacia echinuliflora*	✓				
FABACEAE	*Acacia gonocarpa*	✓				
FABACEAE	*Acacia hammondii*	✓				
FABACEAE	*Acacia helicophylla*	✓				
FABACEAE	*Acacia hemignosta*	✓				✓
FABACEAE	*Acacia holosericea*	✓	✓			✓
FABACEAE	*Acacia humifusa*	✓				
FABACEAE	*Acacia lamprocarpa*	✓	✓			
FABACEAE	*Acacia latescens*	✓				
FABACEAE	*Acacia lycopodiifolia*	✓				
FABACEAE	*Acacia lysiphloia*	✓				
FABACEAE	*Acacia malloclada*	✓				
FABACEAE	*Acacia mimula*	✓	✓			
FABACEAE	*Acacia multisiliqua*	✓				

FABACEAE	*Acacia neurocarpa*					✓
FABACEAE	*Acacia pellita*	✓				
FABACEAE	*Acacia platycarpa*	✓	✓			
FABACEAE	*Acacia plectocarpa subsp. indeterminate*	✓				
FABACEAE	*Acacia plectocarpa subsp. plectocarpa*	✓				
FABACEAE	*Acacia sericoflora*	✓				
FABACEAE	*Acacia sp.*	✓				
FABACEAE	*Acacia sp. 1*				✓	
FABACEAE	*Acacia sp. 2*				✓	
FABACEAE	*Acacia sp. 3*					✓
FABACEAE	*Acacia stigmatophylla*	✓				
FABACEAE	*Acacia umbellata*	✓				
FABACEAE	*Aeschynomene indica*	✓				
FABACEAE	*Aeschynomene villosa*	✓				
FABACEAE	*Allosyncarpia sp.*					✓
FABACEAE	*Alysicarpus ovalifolius*					✓
FABACEAE	*Alysicarpus ovalifolius*	✓				
FABACEAE	*Alysicarpus schomburgkii*	✓			✓	✓
FABACEAE	*Alysicarpus sp.*	✓				
FABACEAE	*Alysicarpus suffruticosus*	✓				
FABACEAE	*Aphyllodium schindleri*	✓				
FABACEAE	*Cajanus acutifolius*	✓				
FABACEAE	*Cajanus geminatus*	✓				
FABACEAE	*Cajanus marmoratus*	✓				
FABACEAE	*Cajanus reticulatus var. grandifolius*	✓				
FABACEAE	*Cajanus reticulatus var. indeterminate*	✓				
FABACEAE	*Cassia mimosoides*		✓			
FABACEAE	*Chamaecrista absus var. absus*	✓				
FABACEAE	*Chamaecrista mimosoides*	✓			✓	
FABACEAE	*Chamaecrista nictitans*					✓
FABACEAE	*Chamaecrista nomame var. indeterminate*	✓				
FABACEAE	*Chamaecrista rotundifolia*					✓
FABACEAE	*Chamaecrista sp.*	✓				

FABACEAE	*Clitoria australis*	✓	✓			
FABACEAE	*Crotalaria brevis*	✓				
FABACEAE	*Crotalaria calycina*	✓				✓
FABACEAE	*Crotalaria crispata*	✓				
FABACEAE	*Crotalaria goreensis*				✓	
FABACEAE	*Crotalaria humifusa*	✓				
FABACEAE	*Crotalaria medicaginea*					✓
FABACEAE	*Crotalaria medicaginea var. indeterminate*	✓	✓			
FABACEAE	*Crotalaria medicaginea var. neglecta*	✓				
FABACEAE	*Crotalaria montana*				✓	✓
FABACEAE	*Crotalaria montana var. angustifolia*	✓				
FABACEAE	*Crotalaria montana var. indeterminate*	✓				
FABACEAE	*Crotalaria novae-hollandiae*				✓	
FABACEAE	*Crotalaria retusa*	✓				✓
FABACEAE	*Crotalaria sp. 1*				✓	
FABACEAE	*Crotalaria sp. 2*				✓	
FABACEAE	*Cullen badocanum*	✓				
FABACEAE	*Cyclocarpa stellaris*	✓				
FABACEAE	*Desmodium brownii*	✓			✓	✓
FABACEAE	*Desmodium flagellare*	✓				
FABACEAE	*Desmodium glareosum*	✓			✓	
FABACEAE	*Desmodium muelleri*		✓			
FABACEAE	*Desmodium pullenii*	✓				
FABACEAE	*Desmodium pycnotrichum*	✓				
FABACEAE	*Desmodium remotiflora*					✓
FABACEAE	*Desmodium sp.*	✓				
FABACEAE	*Desmodium sp. 'Pine Creek'*					✓
FABACEAE	*Desmodium trichostachyum*					✓
FABACEAE	*Dunbaria singuliflora*	✓	✓			
FABACEAE	*Erythrina vespertilio*				✓	
FABACEAE	*Erythrophleum chlorostachys*	✓	✓		✓	✓
FABACEAE	*Flemingia lineata*	✓				
FABACEAE	*Flemingia parviflora*					✓

FABACEAE	*Galactia muelleri*	✓			✓	✓
FABACEAE	*Galactia sp.*	✓				
FABACEAE	*Galactia sp. Short inflorescence (R.A.Kerrigan 595)*	✓				
FABACEAE	*Galactia tenuiflora*	✓				✓
FABACEAE	*Glycine sp.*				✓	
FABACEAE	*Glycine tomentella*	✓	✓			
FABACEAE	*Gompholobium subulatum*	✓				
FABACEAE	*Indigastrum parviflorum*	✓				
FABACEAE	*Indigofera colutea*	✓				
FABACEAE	*Indigofera haplophylla*		✓			
FABACEAE	*Indigofera hirsuta*	✓				
FABACEAE	*Indigofera linifolia*	✓	✓		✓	
FABACEAE	*Indigofera saxicola*	✓				
FABACEAE	*Indigofera sp.*	✓				
FABACEAE	*Indigophera trita*		✓			
FABACEAE	*Jacksonia dilatata*	✓				
FABACEAE	*Jacksonia effusa*	✓				
FABACEAE	*Leptosema uniflorum*	✓				
FABACEAE	*Leptosema villosum*	✓				
FABACEAE	*Neptunia dimorphantha*	✓				
FABACEAE	*Neptunia gracilis*		✓			
FABACEAE	*Neptunia gracilis f. indeterminate*	✓				
FABACEAE	*Neptunia major*	✓				✓
FABACEAE	*Senna cladophylla*	✓				
FABACEAE	*Senna leptoclada*	✓				
FABACEAE	*Senna sp.*	✓				
FABACEAE	*Senna sp. Pine Creek (P.Martensz 480)*	✓				
FABACEAE	*Sesbania cannabina var. indeterminate*	✓				
FABACEAE	*Sesbania formosa*				✓	
FABACEAE	*Sesbania sp.*					✓
FABACEAE	*Stylosanthes hamata*	✓			✓	✓
FABACEAE	*Stylosanthes viscosa*					✓
FABACEAE	*Templetonia hookeri*	✓				

FABACEAE	*Tephrosia arnhemica*		✓		
FABACEAE	*Tephrosia brachyodon var. longifolia*	✓			
FABACEAE	*Tephrosia carriemichelliae*	✓			
FABACEAE	*Tephrosia ephippioides*	✓			
FABACEAE	*Tephrosia gyropoda*	✓			
FABACEAE	*Tephrosia leptoclada*	✓			
FABACEAE	*Tephrosia nematophylla*	✓			
FABACEAE	*Tephrosia oblongata*	✓	✓		
FABACEAE	*Tephrosia phaeosperma*	✓			
FABACEAE	*Tephrosia polyzyga*	✓		✓	✓
FABACEAE	*Tephrosia porrecta*	✓			
FABACEAE	*Tephrosia remotiflora*	✓			
FABACEAE	*Tephrosia reticulata*	✓			
FABACEAE	*Tephrosia simplicifolia*	✓			
FABACEAE	*Tephrosia sp.*	✓		✓	
FABACEAE	*Tephrosia sp. affin virens BW 170*		✓		
FABACEAE	*Tephrosia sp. nova. BW 183*		✓		
FABACEAE	*Tephrosia sp. Pentecost River (I.D.Cowie 4168)*	✓			
FABACEAE	*Tephrosia spechtii*	✓			
FABACEAE	*Tephrosia subpectinata*	✓			
FABACEAE	*Tephrosia virens*				✓
FABACEAE	*Uraria cylindracea Benth.*		✓		
FABACEAE	*Uraria lagopodioides*	✓	✓		✓
FABACEAE	*Vachellia pachyphloia*		✓		
FABACEAE	*Vachellia pallidifolia*	✓			
FABACEAE	*Vachellia valida*	✓			
FABACEAE	*Vigna lanceolata var. filiformis*	✓			
FABACEAE	*Vigna lanceolata var. indeterminate*	✓			
FABACEAE	*Vigna lanceolata var. latifolia*	✓			
FABACEAE	*Vigna laneolata*		✓		
FABACEAE	*Vigna radiata var. indeterminate*	✓			
FABACEAE	*Vigna radiata var. sublobata*	✓			✓
FABACEAE	*Vigna sp.*	✓			

FABACEAE	*Vigna vexillata*		✓			
FABACEAE	*Vigna vexillata var. angustifolia*					✓
FABACEAE	*Vigna vexillata var. vexillata*	✓				✓
FABACEAE	*Zornia areolata*	✓				
FABACEAE	*Zornia muriculata subsp. indeterminate*	✓				
FABACEAE	*Zornia prostrata var. indeterminate*	✓				✓
FABACEAE	*Zornia prostrata var. macrantha*	✓				
FLAGELLARIACEAE	*Flagellaria indica*		✓			
GENTIANACEAE	*Canscora diffusa*	✓				
GLEICHENIACEAE	*Dicranopteris linearis var. linearis*	✓				
GOODENIACEAE	*Goodenia armstrongiana*	✓				
GOODENIACEAE	*Goodenia heppleana*	✓				
GOODENIACEAE	*Goodenia holtzeana*	✓				
GOODENIACEAE	*Goodenia janamba*	✓				
GOODENIACEAE	*Goodenia lamprosperma*	✓				
GOODENIACEAE	*Goodenia pilosa*		✓		✓	✓
GOODENIACEAE	*Goodenia purpurascens*	✓				
GOODENIACEAE	*Goodenia purpurea*	✓				
GOODENIACEAE	*Goodenia sp.*	✓				
GOODENIACEAE	*Goodenia subauriculata*	✓				
HAEMODORACEAE	*Haemodorum coccineum*	✓				
HAEMODORACEAE	*Haemodorum leptostachyum*	✓				
HAEMODORACEAE	*Haemodorum parviflorum*	✓				
HALORAGACEAE	*Gonocarpus chinensis subsp. chinensis*	✓				
HALORAGACEAE	*Gonocarpus leptothecus*	✓				
HALORAGACEAE	*Myriophyllum trachycarpum*	✓				
HEMEROCALLIDACEAE	*Corynotheca lateriflora*	✓				
HYDATELLACEAE	*Trithuria lanterna*	✓				
HYDROCHARITACEAE	*Blyxa aubertii var. echinosperma*	✓				
HYDROLEACEAE	*Hydrolea zeylanica*	✓				
HYPOXIDACEAE	*Curculigo ensifolia var. indeterminate*	✓				
IRIDACEAE	*Patersonia macrantha*	✓				
ISOETACEAE	*Isoetes coromandelina subsp. macrotuberculata*	✓				

LAMIACEAE	*Anisomeles malabarica*	✓			
LAMIACEAE	*Clerodendrum floribundum var. indeterminate*	✓	✓		
LAMIACEAE	*Clerodendrum tatei*	✓			✓
LAMIACEAE	*Hyptis suaveolens*	✓	✓	✓	✓
LAMIACEAE	*Pityrodia quadrangulata*	✓			
LAMIACEAE	*Pityrodia spenceri*	✓			
LAMIACEAE	*Premna acuminata*	✓	✓		
LAMIACEAE	*Premna herbacea*	✓	✓		
LAMIACEAE	*Vitex glabrata*	✓	✓		
LAURACEAE	*Cassytha capillaris*	✓			
LAURACEAE	*Cassytha filiformis*	✓			
LECYTHIDACEAE	*Planchonia careya*	✓	✓		✓
LENTIBULARIACEAE	*Utricularia arnhemica*	✓			
LENTIBULARIACEAE	*Utricularia caerulea*	✓			
LENTIBULARIACEAE	*Utricularia chrysantha*	✓		✓	
LENTIBULARIACEAE	*Utricularia fulva*	✓			
LENTIBULARIACEAE	*Utricularia gibba*	✓			
LENTIBULARIACEAE	*Utricularia kimberleyensis*	✓			✓
LENTIBULARIACEAE	*Utricularia odorata*	✓			
LENTIBULARIACEAE	*Utricularia quinquedentata*	✓			
LENTIBULARIACEAE	*Utricularia singeriana*	✓			
LINDERNIACEAE	*Lindernia clausa*	✓			
LINDERNIACEAE	*Lindernia plantaginea*	✓			
LINDERNIACEAE	*Lindernia scapigera*	✓			
LINDERNIACEAE	*Lindernia tectanthera*	✓			
LINDERNIACEAE	*Microcarpaea minima*	✓			
LINDSAEACEAE	*Lindsaea ensifolia*	✓			
LOGANIACEAE	*Mitrasacme ambigua*	✓			
LOGANIACEAE	*Mitrasacme connata*	✓			
LOGANIACEAE	*Mitrasacme exserta*	✓			
LOGANIACEAE	*Mitrasacme floribunda*	✓			
LOGANIACEAE	*Mitrasacme gentianea*	✓			
LOGANIACEAE	*Mitrasacme glaucescens*	✓			

LOGANIACEAE	*Mitrasacme laevis*	✓			
LOGANIACEAE	*Mitrasacme laricifolia*	✓			
LOGANIACEAE	*Mitrasacme latiflora*	✓	✓		
LOGANIACEAE	*Mitrasacme micrantha*	✓			
LOGANIACEAE	*Mitrasacme multicaulis*	✓			
LOGANIACEAE	*Mitrasacme nudicaulis var. indeterminate*	✓			
LOGANIACEAE	*Mitrasacme nudicaulis var. nudicaulis*	✓			
LOGANIACEAE	*Mitrasacme nummularia*	✓			
LOGANIACEAE	*Mitrasacme retroloba*	✓			
LOGANIACEAE	*Mitrasacme sp.*			✓	✓
LOGANIACEAE	*Mitrasacme squamigera*	✓			
LOMARIOPSIDACEAE	*Nephrolepis hirsutula*	✓			
LYCOPODIACEAE	*Lycopodiella cernua*	✓			
LYGODIACEAE	*Lygodium flexuosum*	✓			
LYGODIACEAE	*Lygodium microphyllum*	✓			
LYTHRACEAE	*Nesaea arnhemica*	✓			
LYTHRACEAE	*Nesaea muelleri*	✓			
LYTHRACEAE	*Rotala diandra*	✓			
LYTHRACEAE	*Rotala mexicana*	✓			
LYTHRACEAE	*Rotala occultiflora*	✓			
LYTHRACEAE	*Rotala sp.*	✓			
MALVACEAE	*Brachychiton diversifolius subsp. diversifolius*	✓	✓	✓	✓
MALVACEAE	*Brachychiton megaphyllus*	✓			
MALVACEAE	*Brachychiton paradoxus*	✓	✓		
MALVACEAE	*Corchorus sidoides subsp. indeterminate*	✓			
MALVACEAE	*Grewia retusifolia*	✓	✓	✓	✓
MALVACEAE	*Helicteres cana*	✓	✓		
MALVACEAE	*Helicteres dentata var. dentata*	✓			
MALVACEAE	*Helicteres dentata var. indeterminate*	✓			
MALVACEAE	*Helicteres sp.*	✓			
MALVACEAE	*Helicteres sp. Darwin (S.T.Blake 16793)*	✓		✓	✓
MALVACEAE	*Helicteres sp. Elongate (J.Must 887)*	✓			
MALVACEAE	*Hibiscus fallax*	✓			

MALVACEAE	*Hibiscus menzeliae*	✓				
MALVACEAE	*Hibiscus meraukensis*	✓			✓	
MALVACEAE	*Hibiscus sabdariffa*	✓			✓	
MALVACEAE	*Hibiscus sp.*	✓				
MALVACEAE	*Melochia corchorifolia*	✓	✓			
MALVACEAE	*Sida acuta*	✓				
MALVACEAE	*Triumfetta albida*	✓				
MALVACEAE	*Triumfetta arnhemica*	✓				
MALVACEAE	*Triumfetta cinerea*	✓				
MALVACEAE	*Triumfetta longipedunculata*	✓				
MALVACEAE	*Triumfetta plumigera*	✓				
MALVACEAE	*Triumfetta sp.*	✓				
MALVACEAE	*Urena lobata*				✓	✓
MALVACEAE	*Waltheria indica*	✓			✓	
MELASTOMATACEAE	*Melastoma malabathricum subsp. malabathricum*	✓				
MELASTOMATACEAE	*Osbeckia australiana*	✓				
MELIACEAE	*Owenia vernicosa*	✓	✓		✓	
MENISPERMACEAE	*Tinospora smilacina*		✓			
MENYANTHACEAE	*Nymphoides aurantiaca*	✓				
MENYANTHACEAE	*Nymphoides furculifolia*	✓				
MENYANTHACEAE	*Nymphoides minima*	✓				
MENYANTHACEAE	*Nymphoides quadriloba*	✓				
MOLLUGINACEAE	*Glinus sessiliflorus*	✓				
MORACEAE	*Ficus aculeata var. aculeata*	✓				✓
MORACEAE	*Ficus aculeata var. indeterminate*	✓				
MORACEAE	*Ficus atricha*	✓				
MORACEAE	*Ficus brachypoda*	✓				
MORACEAE	*Ficus congesta*	✓				
MORACEAE	*Ficus coronulata*	✓	✓			✓
MORACEAE	*Ficus opposita*		✓		✓	✓
MORACEAE	*Ficus platypoda*		✓			
MORACEAE	*Ficus scobina*		✓			
MORACEAE	*Ficus subpuberula*	✓				

MORACEAE	*Ficus virens var. virens*	✓			
MYRTACEAE	*Calytrix achaeta*	✓	✓	✓	✓
MYRTACEAE	*Calytrix arborescens*	✓			
MYRTACEAE	*Calytrix brownii*	✓			
MYRTACEAE	*Calytrix exstipulata*	✓			✓
MYRTACEAE	*Calytrix faucicola*	✓			
MYRTACEAE	*Calytrix verticillata*	✓	✓		
MYRTACEAE	*Corymbia arnhemensis*	✓			
MYRTACEAE	*Corymbia bella*	✓			
MYRTACEAE	*Corymbia bleeseri*	✓			
MYRTACEAE	*Corymbia clavigera*		✓		
MYRTACEAE	*Corymbia confertiflora*	✓	✓		✓
MYRTACEAE	*Corymbia dichromophloia*			✓	✓
MYRTACEAE	*Corymbia dichromophloia*	✓	✓		
MYRTACEAE	*Corymbia disjuncta*	✓			
MYRTACEAE	*Corymbia dunlopiana*	✓			
MYRTACEAE	*Corymbia foelscheana*	✓	✓	✓	
MYRTACEAE	*Corymbia grandifolia subsp. indeterminate*	✓			
MYRTACEAE	*Corymbia jacobsiana*	✓			
MYRTACEAE	*Corymbia kombolgiensis*	✓			
MYRTACEAE	*Corymbia latifolia*	✓	✓		✓
MYRTACEAE	*Corymbia oocarpa*	✓			
MYRTACEAE	*Corymbia papuana*		✓		
MYRTACEAE	*Corymbia polycarpa*	✓	✓		
MYRTACEAE	*Corymbia polysciada*	✓		✓	
MYRTACEAE	*Corymbia ptychocarpa subsp. indeterminate*	✓			
MYRTACEAE	*Corymbia setosa*		✓	✓	
MYRTACEAE	*Eucalyptus / Corymbia sp.*	✓			
MYRTACEAE	*Eucalyptus aff. Latifolia F. Muell. BW 162*		✓		
MYRTACEAE	*Eucalyptus alba var. australasica*	✓			
MYRTACEAE	*Eucalyptus bigalerita*	✓	✓	✓	✓
MYRTACEAE	*Eucalyptus camaldulensis var. obtusa*	✓	✓		✓
MYRTACEAE	*Eucalyptus distans*	✓			

MYRTACEAE	*Eucalyptus herbertiana*	✓			
MYRTACEAE	*Eucalyptus leucophloia subsp. euroa*	✓			
MYRTACEAE	*Eucalyptus miniata*	✓	✓		✓
MYRTACEAE	*Eucalyptus phoenicea*	✓			
MYRTACEAE	*Eucalyptus sp.*				✓
MYRTACEAE	*Eucalyptus tectifica*	✓	✓	✓	✓
MYRTACEAE	*Eucalyptus tetrodonta*	✓	✓		
MYRTACEAE	*Eucalyptus tintinnans*	✓	✓	✓	✓
MYRTACEAE	*Homalocalyx ericaeus*	✓			
MYRTACEAE	*Lophostemon grandiflorus*		✓	✓	
MYRTACEAE	*Lophostemon grandiflorus subsp. indeterminate*	✓			
MYRTACEAE	*Lophostemon lactifluus*	✓		✓	✓
MYRTACEAE	*Lophostemon sp.*	✓			
MYRTACEAE	*Melaleuca argentea*	✓	✓	✓	✓
MYRTACEAE	*Melaleuca leucadendra*	✓	✓	✓	✓
MYRTACEAE	*Melaleuca nervosa subsp. indeterminate*	✓			
MYRTACEAE	*Melaleuca viridiflora*	✓	✓	✓	
MYRTACEAE	*Syzygium angophoroides*	✓			
MYRTACEAE	*Syzygium eucalyptoides subsp. bleeseri*	✓			
MYRTACEAE	*Syzygium eucalyptoides subsp. eucalyptoides*	✓			
MYRTACEAE	*Syzygium forte (F. Muell.) B. Hyland*		✓		
MYRTACEAE	*Syzygium forte subsp. indeterminate*	✓			
MYRTACEAE	*Syzygium forte subsp. potamophilum*	✓			
MYRTACEAE	*Syzygium sp.*	✓			
MYRTACEAE	*Syzygium suborbiculare*	✓			
MYRTACEAE	*Verticordia cunninghamii*	✓	✓		
MYRTACEAE	*Verticordia verticillata*	✓			
MYRTACEAE	*Xanthostemon eucalyptoides*	✓			
MYRTACEAE	*Xanthostemon paradoxus*	✓	✓	✓	✓
NYCTAGINACEAE	*Boerhavia coccinea*	✓			
NYCTAGINACEAE	*Boerhavia dominii*	✓			
NYCTAGINACEAE	*Boerhavia gardneri*	✓			
NYCTAGINACEAE	*Boerhavia sp.*	✓			

NYMPHAEACEAE	*Nymphaea violacea*	✓				
OLACACEAE	*Olax aphylla*	✓				
OLEACEAE	*Jasminum molle*	✓	✓			
ONAGRACEAE	*Ludwigia octovalvis*	✓			✓	
ONAGRACEAE	*Ludwigia perennis*	✓				
OPHIOGLOSSACEAE	*Ophioglossum gramineum*	✓				
OPHIOGLOSSACEAE	*Ophioglossum sp.*	✓				
ORCHIDACEAE	*Habenaria halata*	✓				
ORCHIDACEAE	*Habenaria ochroleuca*	✓				✓
OROBANCHACEAE	*Buchnera gracilis*	✓				
OROBANCHACEAE	*Buchnera linearis*	✓	✓			✓
OROBANCHACEAE	*Buchnera ramosissima*	✓				
OROBANCHACEAE	*Buchnera sp.*	✓			✓	
OROBANCHACEAE	*Buchnera tetragona*	✓				
OROBANCHACEAE	*Buchnera urticifolia*	✓				
OROBANCHACEAE	*Centranthera cochinchinensis*	✓			✓	
PANDANACEAE	*Pandanus aquaticus*	✓	✓			✓
PANDANACEAE	*Pandanus spiralis*	✓				
PASSIFLORACEAE	*Passiflora foetida*	✓	✓		✓	✓
PHILYDRACEAE	*Philydrum lanuginosum*	✓				
PHRYMACEAE	*Mimulus sp. Groote Eylandt (R.L.Specht 335)*	✓				
PHYLLANTHACEAE	*Antidesma ghesaembilla*	✓				
PHYLLANTHACEAE	*Breynia cernua*					✓
PHYLLANTHACEAE	*Breynia cernua*	✓				
PHYLLANTHACEAE	*Bridelia tomentosa*	✓	✓			
PHYLLANTHACEAE	*Flueggea virosa*		✓			
PHYLLANTHACEAE	*Flueggea virosa subsp. melanthesoides*	✓				
PHYLLANTHACEAE	*Glochidion xerocarpum*		✓			
PHYLLANTHACEAE	*Phyllanthus carpentariae*	✓				
PHYLLANTHACEAE	*Phyllanthus eutaxioides*	✓				
PHYLLANTHACEAE	*Phyllanthus exilis*	✓			✓	
PHYLLANTHACEAE	*Phyllanthus minutiflorus*	✓				
PHYLLANTHACEAE	*Phyllanthus sp.*	✓				

PHYLLANTHACEAE	*Phyllanthus virgatus*	✓	✓		
PHYLLANTHACEAE	*Phyllantus sp. BW 163*		✓		
PHYLLANTHACEAE	*Sauropus brunonis*		✓		
PHYLLANTHACEAE	*Sauropus dunlopii*	✓			
PHYLLANTHACEAE	*Sauropus glaucus*	✓	✓		
PHYLLANTHACEAE	*Sauropus paucifolius*	✓			
PHYLLANTHACEAE	*Sauropus rigidulus*	✓			
PHYLLANTHACEAE	*Sauropus sp.*	✓			
PHYLLANTHACEAE	*Sauropus stenocladus subsp. pinifolius*	✓			
PICRODENDRACEAE	*Petalostigma banksii*	✓		✓	
PICRODENDRACEAE	*Petalostigma pubescens*	✓		✓	
PICRODENDRACEAE	*Petalostigma quadriloculare*	✓	✓	✓	✓
PLANTAGINACEAE	*Bacopa floribunda*	✓			
PLANTAGINACEAE	*Limnophila australis*	✓			
PLANTAGINACEAE	*Limnophila fragrans*	✓			
PLANTAGINACEAE	*Limnophila sp.*	✓			
PLANTAGINACEAE	*Scoparia dulcis*	✓			✓
PLANTAGINACEAE	*Stemodia lythrifolia*				✓
PLANTAGINACEAE	*Stemodia lythrifolia*	✓	✓	✓	
PLANTAGINACEAE	*Stemodia viscosa*	✓			
PLANTAGINACEAE	*Striga curviflora*	✓			✓
PLANTAGINACEAE	*Striga sp.*				✓
POACEAE	*Alloteropsis semialata*	✓	✓	✓	✓
POACEAE	*Andropogon gayanus*			✓	
POACEAE	*Aristida aff. pruinosa_BW 175*		✓		
POACEAE	*Aristida calycina*			✓	
POACEAE	*Aristida calycina var. indeterminate*	✓			
POACEAE	*Aristida dominii*	✓			
POACEAE	*Aristida holathera var. holathera*	✓	✓		
POACEAE	*Aristida holathera var. indeterminate*	✓			
POACEAE	*Aristida hygrometrica*	✓			
POACEAE	*Aristida macroclada subsp. indeterminate*	✓			
POACEAE	*Aristida perniciosa*	✓			

POACEAE	*Aristida pruinosa*	✓				
POACEAE	*Aristida sp.*	✓				
POACEAE	*Aristida utilis var. utilis*	✓				
POACEAE	*Arundinella nepalensis*	✓				
POACEAE	*Bothriochloa bladhii subsp. bladhii*	✓	✓		✓	
POACEAE	*Brachiaria holosericea*					✓
POACEAE	*Brachiaria mutica*					✓
POACEAE	*Brachyachne convergens*	✓				
POACEAE	*Capillipedium parviflorum*	✓				
POACEAE	*Cenchrus ciliaris*				✓	
POACEAE	*Chamaeraphis hordeacea*	✓				
POACEAE	*Chloris gayana*				✓	
POACEAE	*Chrysopogon aciculatus*	✓				
POACEAE	*Chrysopogon fallax*	✓				✓
POACEAE	*Chrysopogon latifolius*	✓	✓			
POACEAE	*Chrysopogon setifolius*	✓	✓			
POACEAE	*Chrysopogon sp.*	✓				
POACEAE	*Clausospicula extensa*	✓				
POACEAE	*Cymbopogon bombycinus*	✓			✓	✓
POACEAE	*Cymbopogon dependens*	✓				
POACEAE	*Cymbopogon procerus*	✓			✓	
POACEAE	*Cynodon radiatus*					✓
POACEAE	*Digitaria gibbosa*	✓				
POACEAE	*Digitaria longiflora*	✓				
POACEAE	*Echinochloa colona*	✓	✓			
POACEAE	*Ectrosia agrostoides*	✓				
POACEAE	*Ectrosia confusa*	✓				
POACEAE	*Ectrosia danesii*	✓				
POACEAE	*Ectrosia leporina*	✓				
POACEAE	*Ectrosia schultzii var. indeterminate*	✓				
POACEAE	*Eleusine indica*	✓				
POACEAE	*Elytrophorus spicatus*	✓			✓	
POACEAE	*Eragrostis cumingii*	✓			✓	

POACEAE	*Eragrostis exigua*	✓				
POACEAE	*Eragrostis fallax*	✓				
POACEAE	*Eragrostis filicaulis*	✓				
POACEAE	*Eragrostis rigidiuscula*	✓				
POACEAE	*Eragrostis schultzii*	✓				
POACEAE	*Eragrostis sp.*	✓			✓	
POACEAE	*Eragrostis spartinoides*	✓				
POACEAE	*Eragrostis stagnalis*	✓				
POACEAE	*Eragrostis sterilis*	✓				
POACEAE	*Eragrostis tenellula*	✓				
POACEAE	*Eriachne agrostidea*	✓				
POACEAE	*Eriachne armittii*	✓				
POACEAE	*Eriachne avenacea*	✓	✓		✓	
POACEAE	*Eriachne basedowii*	✓				
POACEAE	*Eriachne burkittii*	✓				
POACEAE	*Eriachne capillaris*	✓				
POACEAE	*Eriachne ciliata*	✓	✓		✓	✓
POACEAE	*Eriachne glandulosa*	✓				
POACEAE	*Eriachne major*	✓				
POACEAE	*Eriachne melicacea*	✓				
POACEAE	*Eriachne mucronata*	✓				
POACEAE	*Eriachne nodosa*	✓				✓
POACEAE	*Eriachne obtusa var. indeterminate*	✓	✓			
POACEAE	*Eriachne schultziana*	✓				
POACEAE	*Eriachne semiciliata*					✓
POACEAE	*Eriachne sp.*	✓			✓	
POACEAE	*Eriachne squarrosa*	✓				
POACEAE	*Eriachne sulcata*	✓			✓	
POACEAE	*Eriachne triseta*	✓				
POACEAE	*Eriochloa pseudacrotricha*				✓	
POACEAE	*Eulalia annua*	✓			✓	
POACEAE	*Eulalia mackinlayi*	✓				✓
POACEAE	*Germainia grandiflora*	✓				

POACEAE	*Germainia truncatiglumis*	✓			
POACEAE	*Heterachne abortiva*	✓			
POACEAE	*Heteropogon contortus*	✓			✓
POACEAE	*Heteropogon triticeus*	✓		✓	✓
POACEAE	*Imperata cylindrica*				✓
POACEAE	*Isachne confusa*	✓			
POACEAE	*Ischaemum australe var. arundinaceum*	✓			
POACEAE	*Ischaemum australe var. indeterminate*	✓			
POACEAE	*Ischaemum rugosum var. indeterminate*	✓			
POACEAE	*Ischaemum sp.*	✓			
POACEAE	*Melinis repens*	✓		✓	
POACEAE	*Mnesithea formosa*	✓	✓		
POACEAE	*Mnesithea rottboellioides*	✓	✓	✓	✓
POACEAE	*Mnesithea sp.*	✓			
POACEAE	*Panicum effusum*	✓			
POACEAE	*Panicum laevinode*	✓			
POACEAE	*Panicum mindanaense*	✓	✓		
POACEAE	*Panicum paludosum*				✓
POACEAE	*Panicum seminudum var. indeterminate*	✓			
POACEAE	*Panicum sp.*	✓			
POACEAE	*Panicum trachyrhachis*	✓		✓	
POACEAE	*Paspalidium rarum*	✓			
POACEAE	*Paspalum scrobiculatum*	✓	✓		✓
POACEAE	*Pennisetum pedicellatum subsp. indeterminate*	✓		✓	
POACEAE	*Pennisetum polystachion subsp. indeterminate*	✓		✓	
POACEAE	*Perotis rara*	✓			
POACEAE	*Plectrachne pungens*		✓		
POACEAE	*Pseudopogonatherum contortum*	✓			
POACEAE	*Pseudopogonatherum irritans*	✓			
POACEAE	*Pseudopogonatherum sp.*	✓			
POACEAE	*Sacciolepis indica*	✓		✓	
POACEAE	*Sacciolepis myosuroides*	✓			
POACEAE	*Sarga intrans*	✓	✓		✓

POACEAE	*Sarga plumosum*	✓	✓		
POACEAE	*Sarga sp.*	✓			
POACEAE	*Sarga timorense*	✓		✓	✓
POACEAE	*Schizachyrium crinizonatum*	✓			
POACEAE	*Schizachyrium fragile*	✓		✓	✓
POACEAE	*Schizachyrium occultum*	✓			
POACEAE	*Schizachyrium pachyarthron*	✓			
POACEAE	*Schizachyrium pseudeulalia*	✓			
POACEAE	*Schizachyrium sp.*	✓			
POACEAE	*Schizachyrium sp. Wingless (S.T.Blake 17764)*	✓			
POACEAE	*Sehima nervosum*	✓	✓		✓
POACEAE	*Setaria apiculata*	✓			
POACEAE	*Setaria surgens*	✓			✓
POACEAE	*Sorghum stipoideum*		✓		
POACEAE	*Sporobolus australasicus*	✓			
POACEAE	*Sporobolus pulchellus*	✓			
POACEAE	*Thaumastochloa major*	✓	✓		✓
POACEAE	*Thaumastochloa rariflora*	✓			
POACEAE	*Thaumastochloa rubra*	✓			
POACEAE	*Thaumastochloa striata*	✓			
POACEAE	*Themeda arguens*		✓		✓
POACEAE	*Themeda triandra*	✓	✓	✓	✓
POACEAE	*Triodia bitextura*	✓			✓
POACEAE	*Triodia melvillei*			✓	
POACEAE	*Triodia microstachya*	✓	✓		
POACEAE	*Triodia sp.*	✓			
POACEAE	*Tripogon loliiformis*	✓			
POACEAE	*undetd grass sp.*	✓			
POACEAE	*Urochloa holosericea*		✓		
POACEAE	*Urochloa holosericea subsp. holosericea*	✓			
POACEAE	*Urochloa holosericea subsp. indeterminate*	✓			
POACEAE	*Urochloa miliiformis*		✓		
POACEAE	*Urochloa polyphylla*	✓			

POACEAE	*Whiteochloa airoides*	✓				
POACEAE	*Whiteochloa capillipes*	✓				
POACEAE	*Whiteochloa multiciliata*	✓				
POACEAE	*Whiteochloa semitonsa*	✓				
POACEAE	*Xerochloa imberbis*	✓				
POACEAE	*Yakirra australiensis var. intermedia*	✓				
POACEAE	*Yakirra majuscula*	✓				
POACEAE	*Yakirra muelleri*	✓				
POACEAE	*Yakirra nulla*	✓				
POACEAE	*Yakirra pauciflora*	✓				
POACEAE	*Yakirra sp.*	✓				
POLYGALACEAE	*Comesperma aphyllum*	✓				
POLYGALACEAE	*Comesperma secundum*	✓				
POLYGALACEAE	*Polygala barbata*	✓				
POLYGALACEAE	*Polygala bifoliata*	✓				
POLYGALACEAE	*Polygala clavistyla*	✓				
POLYGALACEAE	*Polygala coralliformis*	✓				
POLYGALACEAE	*Polygala eriocephala*	✓				✓
POLYGALACEAE	*Polygala exsquarrosa*	✓				
POLYGALACEAE	*Polygala integra*	✓				
POLYGALACEAE	*Polygala linearis*	✓				
POLYGALACEAE	*Polygala longifolia*	✓			✓	✓
POLYGALACEAE	*Polygala orbicularis*		✓			
POLYGALACEAE	*Polygala parviloba*	✓				
POLYGALACEAE	*Polygala sp.*	✓				✓
POLYGALACEAE	*Polygala sp. bent (ms) aka geniculata*				✓	
POLYGALACEAE	*Polygala sp. BW 174*		✓			
POLYGALACEAE	*Polygala sp. BW 178*		✓			
POLYGALACEAE	*Polygala succulenta var. congesta*	✓				
POLYGALACEAE	*Polygala succulenta var. indeterminate*	✓				
POLYGALACEAE	*Polygala succulenta var. succulenta*	✓				
POLYGALACEAE	*Polygala validaflora*	✓				
POLYGALACEAE	*Salomonia ciliata*	✓				

PORTULACACEAE	*Calandrinia sp. Yinberrie Hills (J.L.Egan 4450)*	✓			
PORTULACACEAE	*Calandrinia uniflora*	✓	✓		✓
PORTULACACEAE	*Portulaca bicolor*	✓	✓		
PORTULACACEAE	*Portulaca oligosperma*	✓			
PORTULACACEAE	*Portulaca sp.*	✓			
PRIMULACEAE	*Anagallis pumila*	✓			
PROTEACEAE	*Banksia dentata*	✓			
PROTEACEAE	*Grevillea benthamiana*	✓			
PROTEACEAE	*Grevillea decurrens*	✓	✓	✓	✓
PROTEACEAE	*Grevillea dryandri subsp. dasycarpa*	✓			
PROTEACEAE	*Grevillea dryandri subsp. indeterminate*	✓			
PROTEACEAE	*Grevillea goodii*	✓			
PROTEACEAE	*Grevillea heliosperma*	✓	✓		
PROTEACEAE	*Grevillea mimosoides*	✓	✓		✓
PROTEACEAE	*Grevillea pteridifolia*	✓	✓		
PROTEACEAE	*Grevillea refracta*		✓		
PROTEACEAE	*Grevillea refracta subsp. indeterminate*	✓			
PROTEACEAE	*Grevillea refracta subsp. refracta*	✓			
PROTEACEAE	*Gymnanthera nitida*		✓		
PROTEACEAE	*Hakea arborescens*	✓	✓		
PROTEACEAE	*Hakea lorea*			✓	
PROTEACEAE	*Persoonia falcata*	✓	✓		
PTERIDACEAE	*Cheilanthes brownii*	✓			
PTERIDACEAE	*Cheilanthes caudata*	✓			
PTERIDACEAE	*Cheilanthes contigua*	✓			
PTERIDACEAE	*Cheilanthes fragillima*	✓			
PTERIDACEAE	*Cheilanthes nitida*	✓			✓
PTERIDACEAE	*Cheilanthes pumilio*	✓			
PTERIDACEAE	*Cheilanthes sp.*	✓			
PTERIDACEAE	*Cheilanthes tenuifolia*		✓		✓
PTERIDACEAE	*Platyzoma microphyllum*	✓			
RESTIONACEAE	*Dapsilanthus spathaceus*	✓			
RHAMNACEAE	*Alphitonia excelsa*	✓	✓	✓	✓

RHIZOPHORACEAE	*Carallia brachiata*	✓			✓
RUBIACEAE	*Cyclophyllum schultzii f. indeterminate*	✓			
RUBIACEAE	*Gardenia fucata*	✓			
RUBIACEAE	*Gardenia megasperma*	✓	✓	✓	✓
RUBIACEAE	*Gardenia resinosa subsp. indeterminate*	✓			
RUBIACEAE	*Mitracarpus hirtus*				✓
RUBIACEAE	*Nauclea orientalis*			✓	
RUBIACEAE	*Oldenlandia galioides*	✓			
RUBIACEAE	*Oldenlandia largiflorens*	✓			
RUBIACEAE	*Oldenlandia mitrasacmoides subsp. mitrasacmoides*	✓			
RUBIACEAE	*Oldenlandia sp.*	✓			
RUBIACEAE	*Pavetta brownii var. brownii*	✓			
RUBIACEAE	*Pavetta sp.*	✓			
RUBIACEAE	*Pogonolobus reticulatus*	✓			
RUBIACEAE	*Psydrax pendulina*	✓			
RUBIACEAE	*Psydrax sp.*	✓			
RUBIACEAE	*Spermacoce aurantiseta*	✓			✓
RUBIACEAE	*Spermacoce breviflora*	✓	✓		
RUBIACEAE	*Spermacoce calliantha*	✓			
RUBIACEAE	*Spermacoce erectiloba*	✓			
RUBIACEAE	*Spermacoce leptoloba*	✓			
RUBIACEAE	*Spermacoce omissa*	✓			
RUBIACEAE	*Spermacoce reticulata*	✓			
RUBIACEAE	*Spermacoce rupicola*	✓			
RUBIACEAE	*Spermacoce scabrisina*	✓			
RUBIACEAE	*Spermacoce sp.*	✓			
RUBIACEAE	*Spermacoce sp. 1*			✓	
RUBIACEAE	*Spermacoce sp. 2*			✓	
RUBIACEAE	*Spermacoce sp. 3*				✓
RUBIACEAE	*Spermacoce sp. 4*				✓
RUBIACEAE	*Spermacoce sp. 5*				✓
RUBIACEAE	*Spermacoce sp.BW 179*		✓		
RUBIACEAE	*Spermacoce stenophylla*	✓			

RUTACEAE	*Boronia grandisepala subsp. indeterminate*	✓				
RUTACEAE	*Boronia lanceolata*	✓				
RUTACEAE	*Boronia lanuginosa*	✓				
RUTACEAE	*Citrus gracilis*	✓				
SANTALACEAE	*Exocarpos latifolius*	✓				
SANTALACEAE	*Santalum lanceolatum*	✓				
SAPINDACEAE	*Atalaya hemiglauca*	✓				✓
SAPINDACEAE	*Distichostemon hispidulus var. indeterminate*	✓				
SAPOTACEAE	*Pouteria arnhemica*	✓				
SAPOTACEAE	*Pouteria sericea*	✓				
SELAGINELLACEAE	*Selaginella ciliaris*	✓				
SMILACACEAE	*Smilax australis*					✓
SOLANACEAE	*Physalis minima*					✓
SOLANACEAE	*Solanum dioicum*	✓				
SOLANACEAE	*Solanum echinatum*	✓				
SOLANACEAE	*Solanum sp.*	✓				
STYLIDIACEAE	*Stylidium accedens*	✓				
STYLIDIACEAE	*Stylidium adenophorum*	✓				
STYLIDIACEAE	*Stylidium ceratophorum*	✓				
STYLIDIACEAE	*Stylidium dunlopianum*	✓			✓	
STYLIDIACEAE	*Stylidium multiscapum*	✓				
STYLIDIACEAE	*Stylidium schizanthum*	✓				
STYLIDIACEAE	*Stylidium semipartitum*	✓			✓	
STYLIDIACEAE	*Stylidium sp.*	✓				
STYLIDIACEAE	*Stylidium sp. Edith Falls (K.Brennan 7668)*	✓				
TACCACEAE	*Tacca leontopetaloides*	✓	✓			✓
THYMELAEACEAE	*Thecanthes punicea*	✓				
TILIACEAE	*Triumfetta rhomboidea*		✓			
TILIACEAE	*Triumfetta sp. BW 17**		✓			
VIOLACEAE	*Hybanthus enneaspermus*		✓			✓
VIOLACEAE	*Hybanthus enneaspermus subsp. enneaspermus*	✓				
VIOLACEAE	*Hybanthus enneaspermus subsp. indeterminate*	✓				
VITACEAE	*Ampelocissus acetosa*					✓

VITACEAE	*Ampelocissus frutescens*	✓	✓		✓
VITACEAE	*Cayratia trifolia*	✓	✓		✓
XYRIDACEAE	*Xyris cheumatophila*	✓			
XYRIDACEAE	*Xyris complanata*	✓		✓	
XYRIDACEAE	*Xyris indica*	✓			
XYRIDACEAE	*Xyris oligantha*	✓			
ZYGOPHYLLACEAE	*Tribulopis angustifolia*	✓			
ZYGOPHYLLACEAE	*Tribulopis pentandra*	✓	✓		

Appendix B

Matters of National Environmental Significance (Protected Matters Search Tool Report)

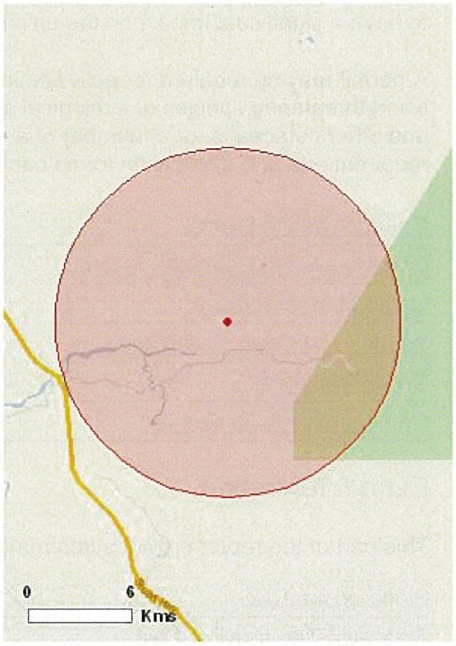
EPBC Act Protected Matters Report

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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 25/06/12 15:03:23



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km

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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	11
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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

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.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

Place on the RNE:	9
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR) [Resource Information]

Name	Proximity
Kakadu (stage 1 & 3)	Upstream from Ramsar

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.

Name	Status	Type of Presence
Arnhem Plateau Sandstone Shrubland Complex	Endangered	Community may occur

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.

Name	Status	Type of Presence within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known 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
Geophaps smithii smithii Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat [132]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat likely to occur within area
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheathtail Bat [66889]	Critically Endangered	Species or species habitat may occur within area
SHARKS		
Pristis microdon Freshwater Sawfish [66182]	Vulnerable	Species or species habitat likely to occur within area

Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Coracina tenuirostris melvillensis Melville Cicadabird [26187]		Species or species habitat may occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known 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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Poecilodryas superciliosa cerviniventris Derby White-browed Robin [26190]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		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
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Ardea ibis Cattle Egret [59542]		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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Yinberrie Hills	NT	Interim List
Acacia Helicophylla Sites	NT	Registered
Calytrix Faucicla Sites	NT	Registered
Calytrix Verticillata Sites	NT	Registered
Edith Falls Reserve (former)	NT	Registered
Hibiscus Menzelii Sites	NT	Registered
Nitmiluk National Park (1978 boundary)	NT	Registered
Historic		
Horseshoe Creek Battery and Settlement Site	NT	Indicative Place
Mount Todd Battery and Settlement Site	NT	Indicative Place

State and Territory Reserves [Resource Information]

Name	State
Nitmiluk (Katherine Gorge)	NT

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Frogs		
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Bubalus bubalis Water Buffalo, Swamp Buffalo [1]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat may occur within area
Pennisetum polystachyon Mission Grass, Perennial Mission Grass, Missiongrass, Feathery Pennisetum, Feather Pennisetum, Thin Napier Grass, West Indian Pennisetum, Blue Buffel Grass [21194]		Species or species habitat likely to occur within area

Coordinates

-14.15402 132.12231

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-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 Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

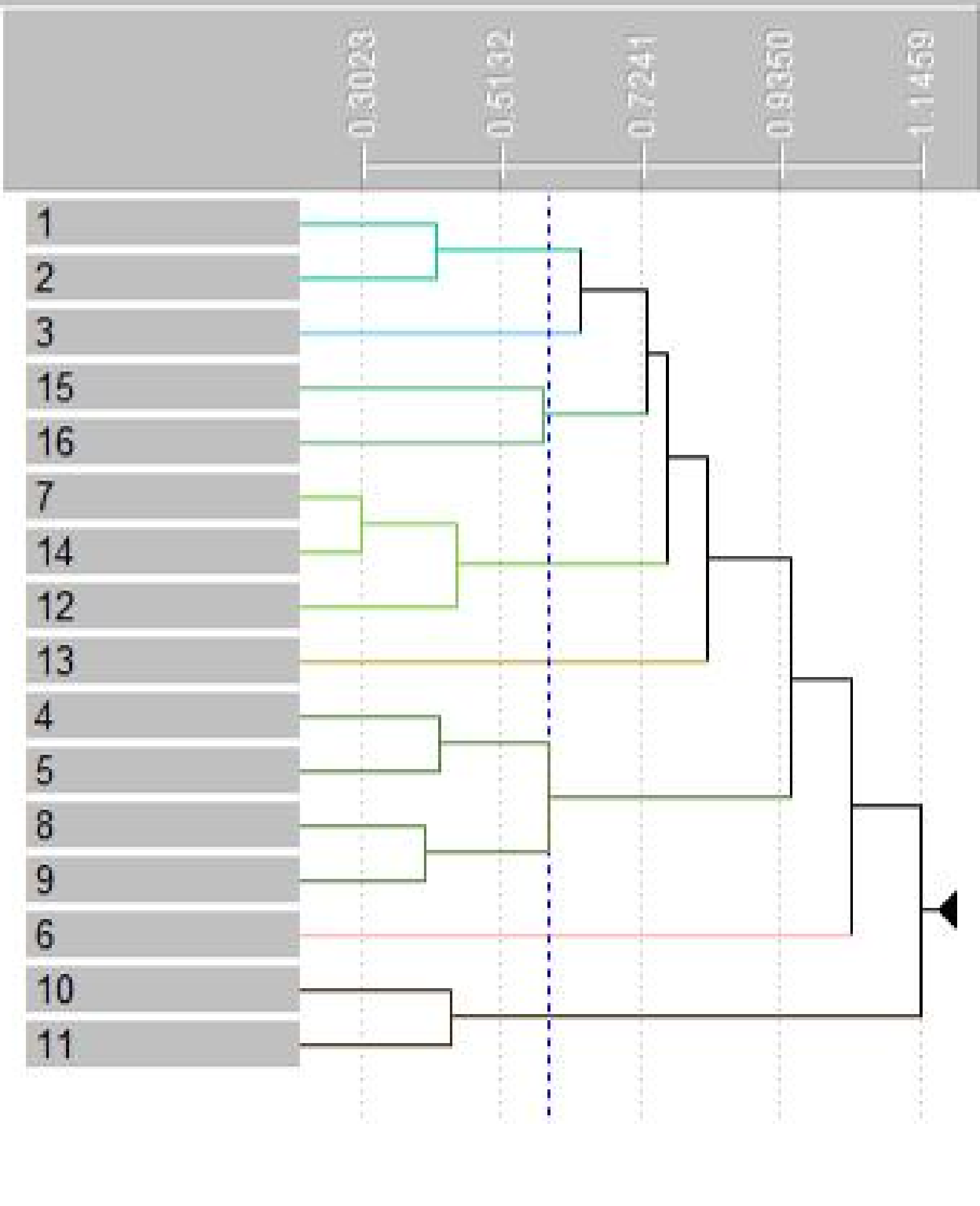
Appendix C

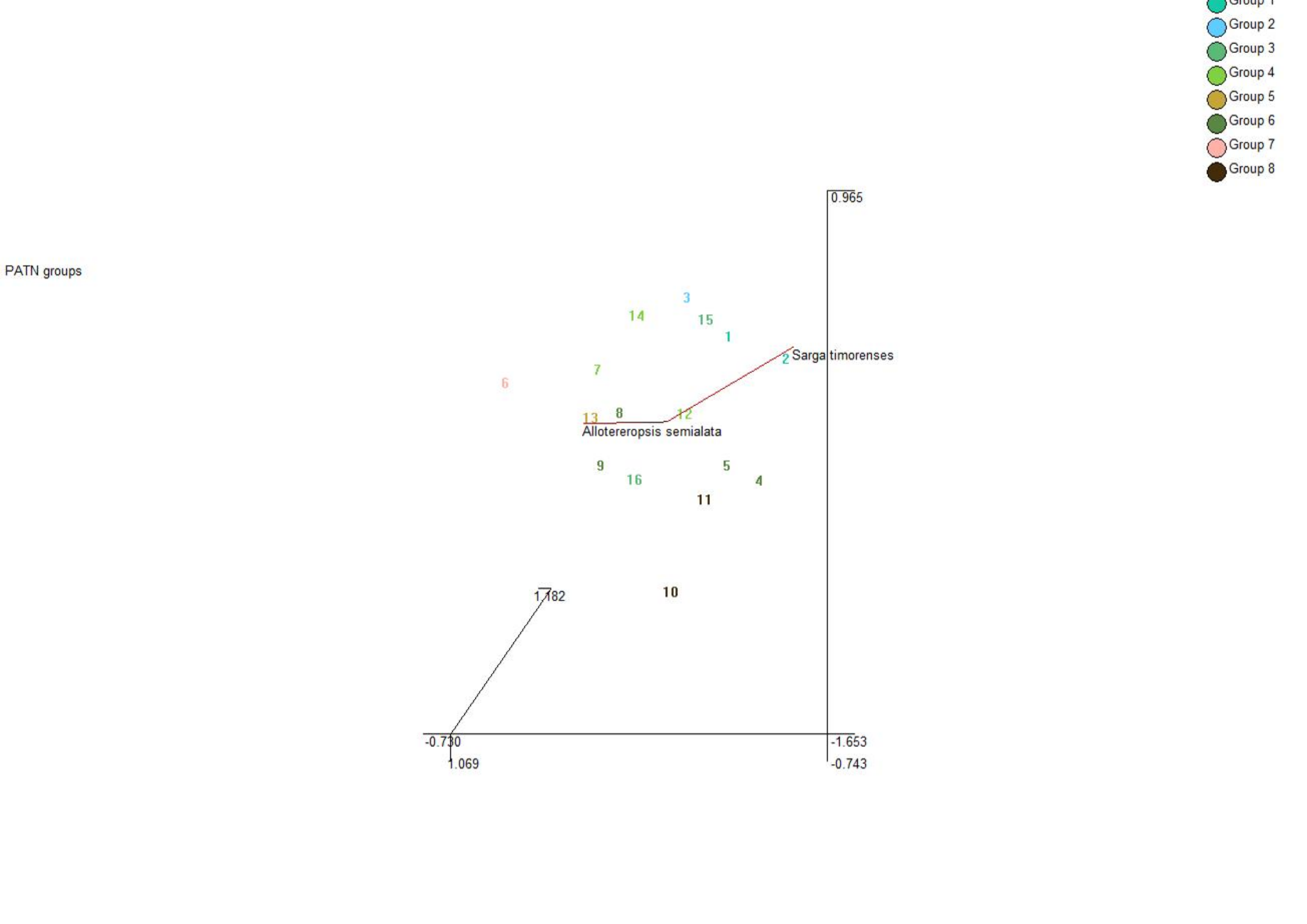
PATN Analysis Results of Vegetation Types

Row Fusion Dendrogram

Ordination Plot

Row Fusion Dendrogram




Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
PATN groups
0.965
3
14
15
1
2
Sarga timorenses
7
6
13
8
12
Allotereropsis semialata
9
5
16
4
11
10
1.182
-0.730
1.069
-1.653
-0.743

GHD

Level 5 66 Smith Street Darwin NT 0800
T: (08) 8982 0100 F: (08) 8981 1075 E: drwmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	A. Quin	N. Conroy		I. McCardle		14/05/13