APPENDIX C

ECOLOGICAL REPORT – SITE A

Ecological Assessment for Master Planning of

Area A, part of Lot 5182 , Town of Darwin

Prepared for:

Project No: DW110010

Project Name: PLANIT Ecological Assessment Rezoning

Catalogue No: D000015255

Report Date: July 2011

Client: Planit Consulting
Doc No. DW110010-C0302-EIA-R-0005
Doc Title: Ecological Assessment Report for Bagot Road Area A

Document Control Record

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Date:	2/8/11

REVISION STATUS

Revision No.	Description of Revision	Date	Approved
1	First Issue	2/8/11	Tom Reilly

Recipients are responsible for eliminating all superseded documents in their possession.

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Executive Summary

EcOz were contracted by PLANIT Consulting to perform an ecological assessment as part of their Masterplan preparation for two parts of Lot 5182 in the Town of Darwin which have been rezoned S D37 with specific use requirements imposed upon them. This report investigates Area A of the newly created S D37 zone.

The assessment consisted of:

- Brief desktop search of available data
- Field visit to ground-truth vegetation and land units
- Mapping

The subject site is a highly disturbed patch of land. It is infested with gamba grass and other weed species, and presents a fire threat to surrounding blocks. However, there are still patches of native vegetation, with three (3) main vegetation communities found onsite:

- Melaleuca Woodland
- Eucalypt Woodland
- Mixed Woodland

There are also smaller patches where Pandanus or Gamba grass are dominant, along with areas for access to easements, and street trees planted along the border with Dick Ward Drive.

The site has been used as a general dumping ground for cars, household appliances, and building spoil which may require investigation for asbestos.

The desktop searches and field visit highlighted a few constraints to the development proposal:

- Land Use / Unit mapping suggests that much of the development site has low to moderate suitability for urban subdivision due to seasonal waterlogging, and slow soil drainage
- The current drainage channel routes would need to be considered when subdividing Lots
- Part of the site would be subject to inundation during 1/1000 storm surges

In summary, based on a qualitative assessment, the ecological condition of the site is not pristine and holds poor conservation value. The site is highly disturbed by weeds, rubbish, busy traffic, and general human impacts. Armstrong's Cycads (vulnerable under the NT *TPWC Act 2000*) were identified within the project area, however, only in low numbers. We suggest that larger specimens are included in a salvage and relocation plan for this site and possibly other sites that Planit are developing in the area.

The **RD** zoned area to the north should not be impacted by the proposed development, as this is of similar poor conservation value as **Area A**, and has similar weed / dumping issues.

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1 Introduction

PLANIT Consultants Pty Ltd (PLANIT) proposes development of two parts of Lot 5182, Ludmilla in the Town of Darwin.

The subject sites have recently been rezoned from **RD – Restricted Development** to **S D37 - Specific Use Zone Darwin No. 37** via an amendment to the Northern Territory Planning Scheme. The amendment determination gives specific conditions as to the types of development that will be possible on the subject sites. Under the requirements of the Northern Territory Planning Scheme amendment, the developer must prepare a Masterplan for the subject sites before submitting a development application for them.

The purpose of this Environmental Site Assessment is to review the proposed development area through a desktop appraisal, site inspection and interviews to determine the potential level of environmental liability that may be attached to the site.

This Environmental Site Assessment has only assessed **Area A** of **S D37**, part of Lot 5182, shown in **Figure 1**. **Area A** can generally be developed in accordance with the provisions of zone **SC – Service Commercial**, but with certain development types prohibited.

Figure 2 shows the existing cadastre boundaries that will be impacted as part of the proposed development.

Figure 1: Proposed Development Location

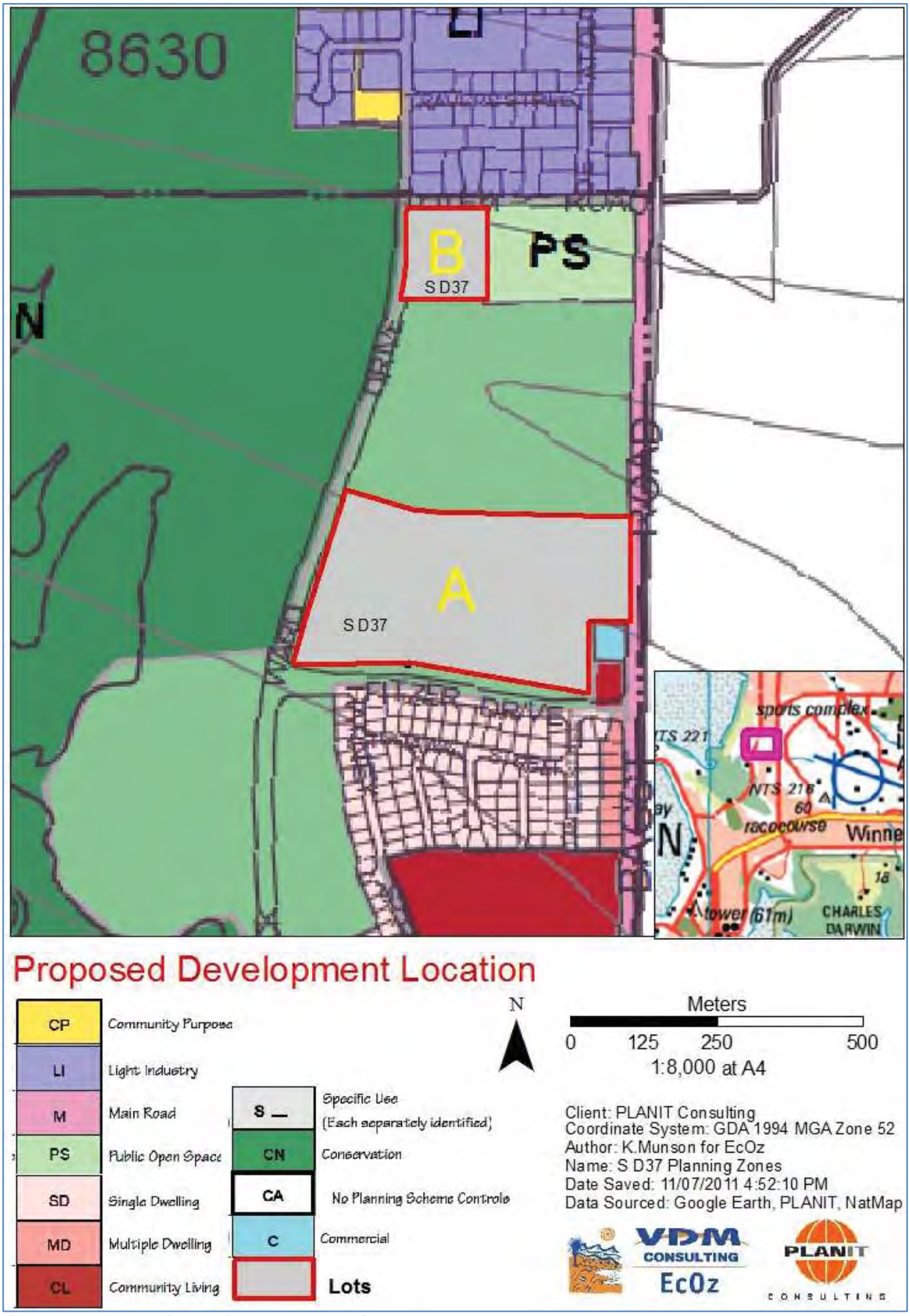


Figure 2 Proposed Development Location

2 Methodology

The scope of work for this report includes:

- Brief desktop searches of available data
- Field Visit for ground-truthing vegetation and land units (one senior and one graduate)
- Report and mapping

so as to identify any existing, and potential constraints on redeveloping the subject site.

Items included in the desktop search include:

- Climate Details
- Soil Types
- Storm Surge
- Acid Sulphate & Potential Acid Sulphate soils
- Land Systems
- Land Units
- Vegetation Types
- Remnant Vegetation
- Heritage Register

Data searches of government maps and reports were studied for the project site and ground truthed during a site visit on the 14th July 2011 by two environmental scientists from EcOz. During the site visit, the proposed development site was inspected for visible signs of:

- Weeds
- Endangered Species
- Property conditions or activities which could potentially result in soil or groundwater contamination
- Waterlogging or seepage areas
- Existing vegetation type and condition

3 Details of Site Investigation

3.1 Proposed Land Use

Area A has recently been rezoned from **RD Restricted Development** to **S D37. Area A** can generally be developed in accordance with the provisions of zone **SC – Service Commercial** with some conditions placed upon development. Before it can be developed, a Masterplan must be prepared detailing the development plan, how the developer plans to meet requirements placed upon **Area A**, and an assessment showing possible flora, fauna and cultural impacts of development upon the land.

3.2 Climate, Geology and Hydrology

The subject site area experiences a tropical savannah climate with a distinct Wet and Dry season. The Wet season brings monsoonal rain and during times of cyclones (including the lows before and after cyclones), the project area experiences significant rainfall events. These rainfall events can cause flooding which is determined by the volume, duration and spatial distribution of the rainfall. In contrast, the Dry season experiences negligible rain.

Most of the rain falls during the Wet season between November and April, while the Dry season from May to October brings negligible rainfall. Darwin falls within the Hot Humid zone, with a mean maximum temperature of 32ºC and mean minimum temperature of 23.2ºC (**Figure 3**). The mean rainfall for Darwin is 1715mm, with 93.5 days of rain, falling mainly within the wet season of November to April (**Figure 4**).

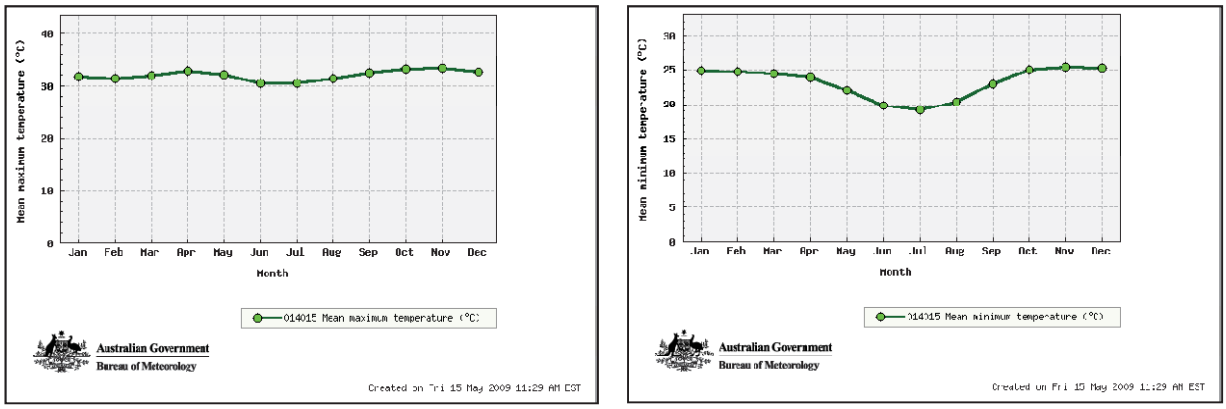


Figure 3: Darwin Airport Mean Maximum and Minimum Temperatures (source BOM 2011)

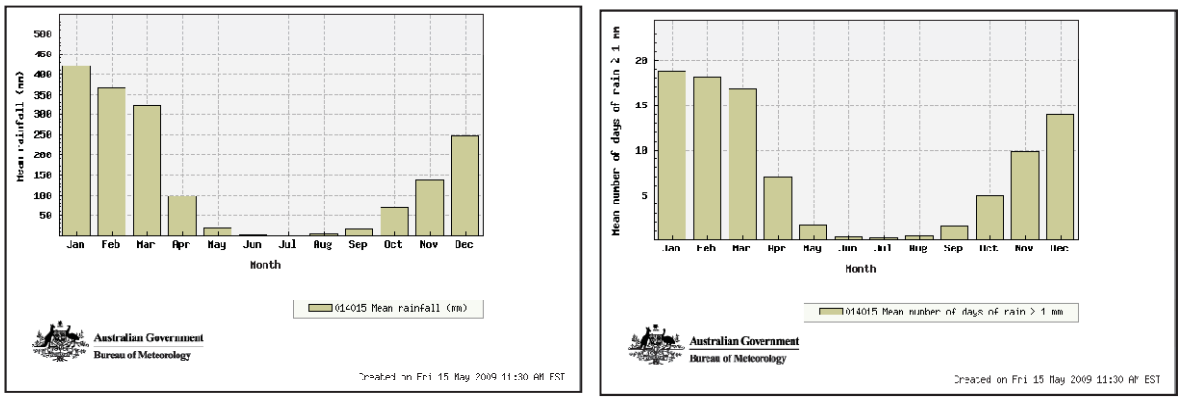


Figure 4: Darwin Airport Rainfall Statistics (source BOM 2011)

The CSIRO - Atlas of Australian Soils, NT Portion, while at a coarse scale, suggests that there are two soil types on the subject site **(Figure 5**). . Kandosols, which account for approximately 85% of the soils in **Area A** lack strong texture contrast, have massive or only weakly structured B horizons, and are not calcareous throughout (Isbell, 2002). Tenosols account for the remaining 15% of the subject site. Tenosols are soils which have weak pedologic organization apart from the A horizon, and include a diverse range of soils that do not fit the requirements of other soil orders (Isbell, 2002).

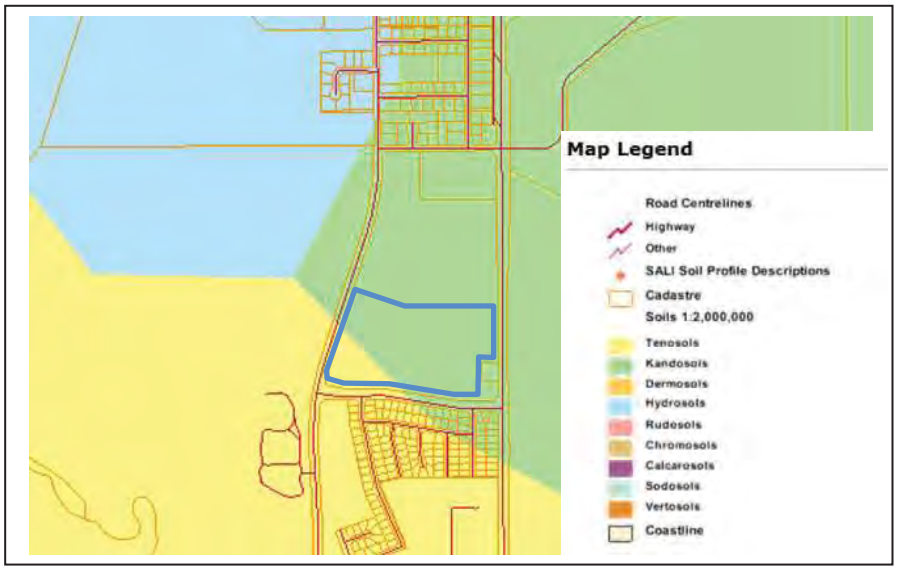


Figure 5: Soil Types at the subject site

The proposed development site is around 1km from the high water mark of Beagle Gulf in the Arafura Sea, and is on a gentle slope (~1%) from east to west. The north west corner of the site is subject to flooding due to storm surge. **Figure 6** shows that approximately 10% of the site could be affected by Secondary Darwin Storm Surge (one in one thousand year event).

Figure 6: Darwin Primary and Secondary Storm Surge Levels

3.2.1 Acid Sulphate Soils

The potential development site has not been assessed for acid sulphate or potential acid sulphate soils **(Figure 7)**. It is classified under the heading of 'No Known Occurrence of Acid Sulphate Soils' in the ACID SULFATE SOILS – Darwin map (NRETAS, 2009).

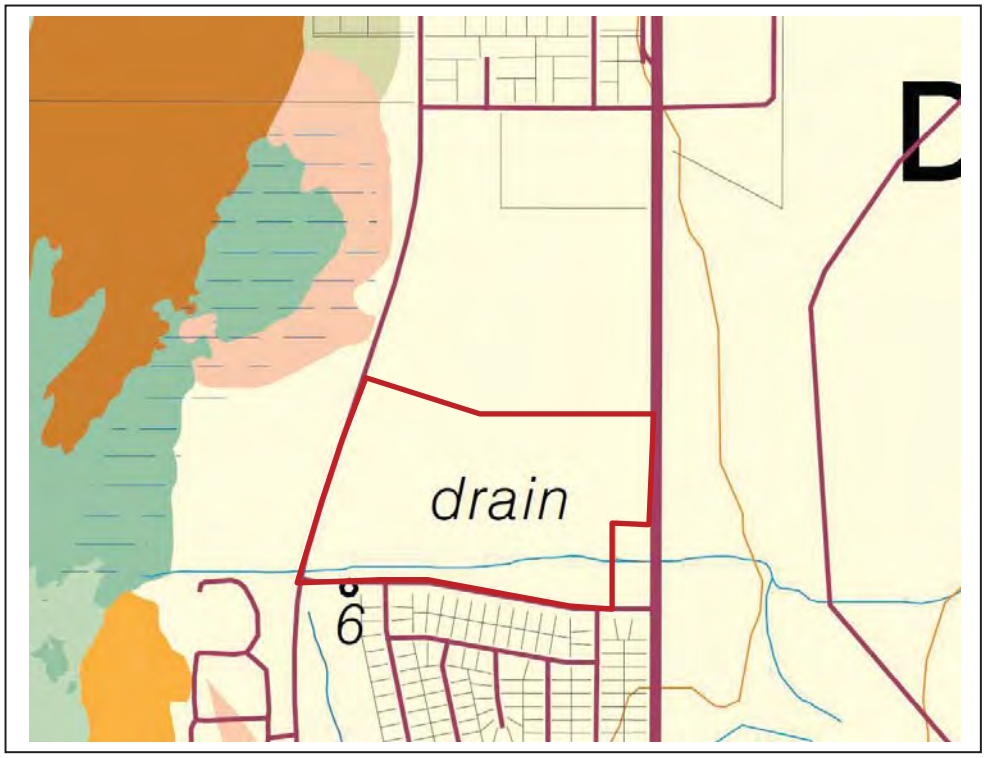


Figure 7: Acid Sulphate Soils and the subject site

3.3 Land Title

A title search was conducted on the land parcels that may be impacted by the proposed development. The current leaseholder for both parcels of land is Gwala Daraniki Association Inc (**Table 1**). The NT Atlas (accessed 12/06/2011) also shows that the property has a Crown Lease Perpetual tenure type (**Figure 8**).

Table 1: Leaseholders that may be impacted by the proposed development

Lot	Leaseholder	Street Address	Tenure
5182, Ludmilla, Town of Darwin	Gwala Daraniki Association Inc	213 Dick Ward Drive, Ludmilla	Crown Lease in Perpetuity 671

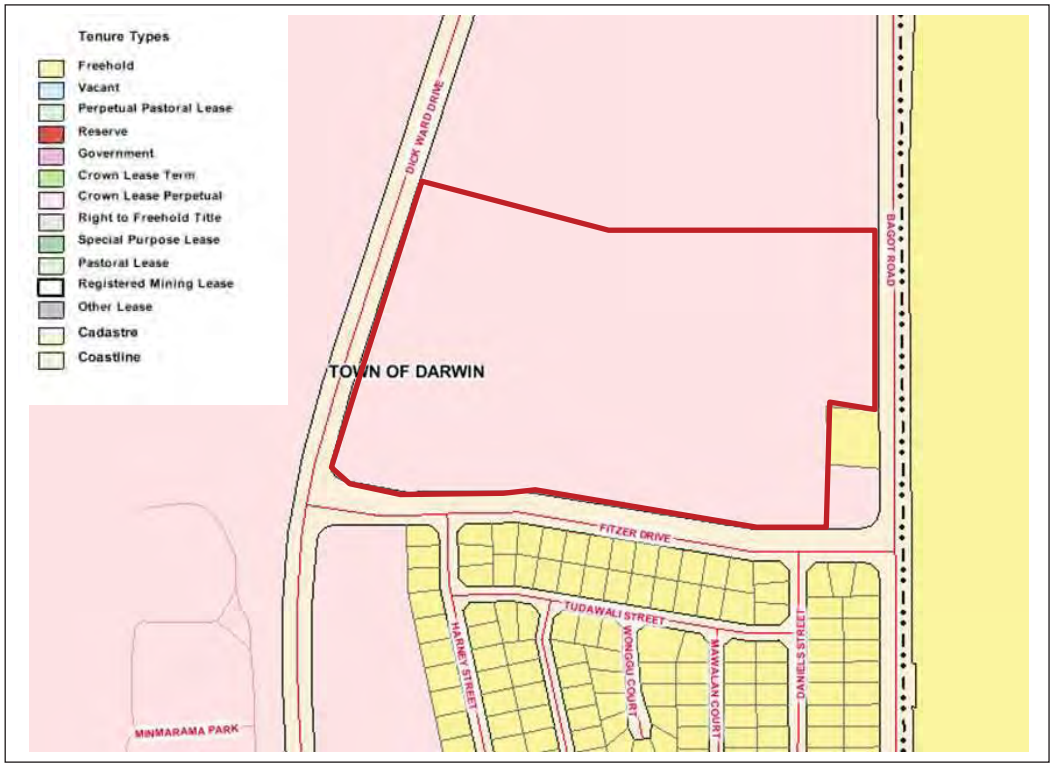


Figure 8: Land Tenure of the proposed development area and surrounds

3.3.1 Land Information

The NT Atlas describes the subject site as part of parcel 5182 in Ludmilla suburb in the Town of Darwin in survey plan S77/93B. Figure 9 shows four easements affecting the subject site. There are two drainage easements along a general east-west direction in the southern section of Area A, a sewer and power line easement which runs in a north-south direction near the western border of Area A. There is also a V shaped drainage easement in the North West corner of the subject site.

3.3.2 Heritage and AAPA searches

A search was performed with the Heritage Branch of NRETAS on Lot 5182 in Ludmilla, Town of Darwin. The Heritage Branch reported that there are no Declared Heritage Places within Lot 5182, but that there are two prescribed archaeological places in either Lot 5182, or nearby Lot 8630. The Heritage Branch also commented that there was the possibility of further burial sites within the boundary of the Lots.

Lots 5182 and 8630 incorporate large areas of land either side of Dick Ward Drive, and no further clarification as to the location of these sites was provided.

No Aboriginal Area Protection Authority (AAPA) search was performed on the site, but it is recommended that the proponent gains appropriate clearance before any development commences.

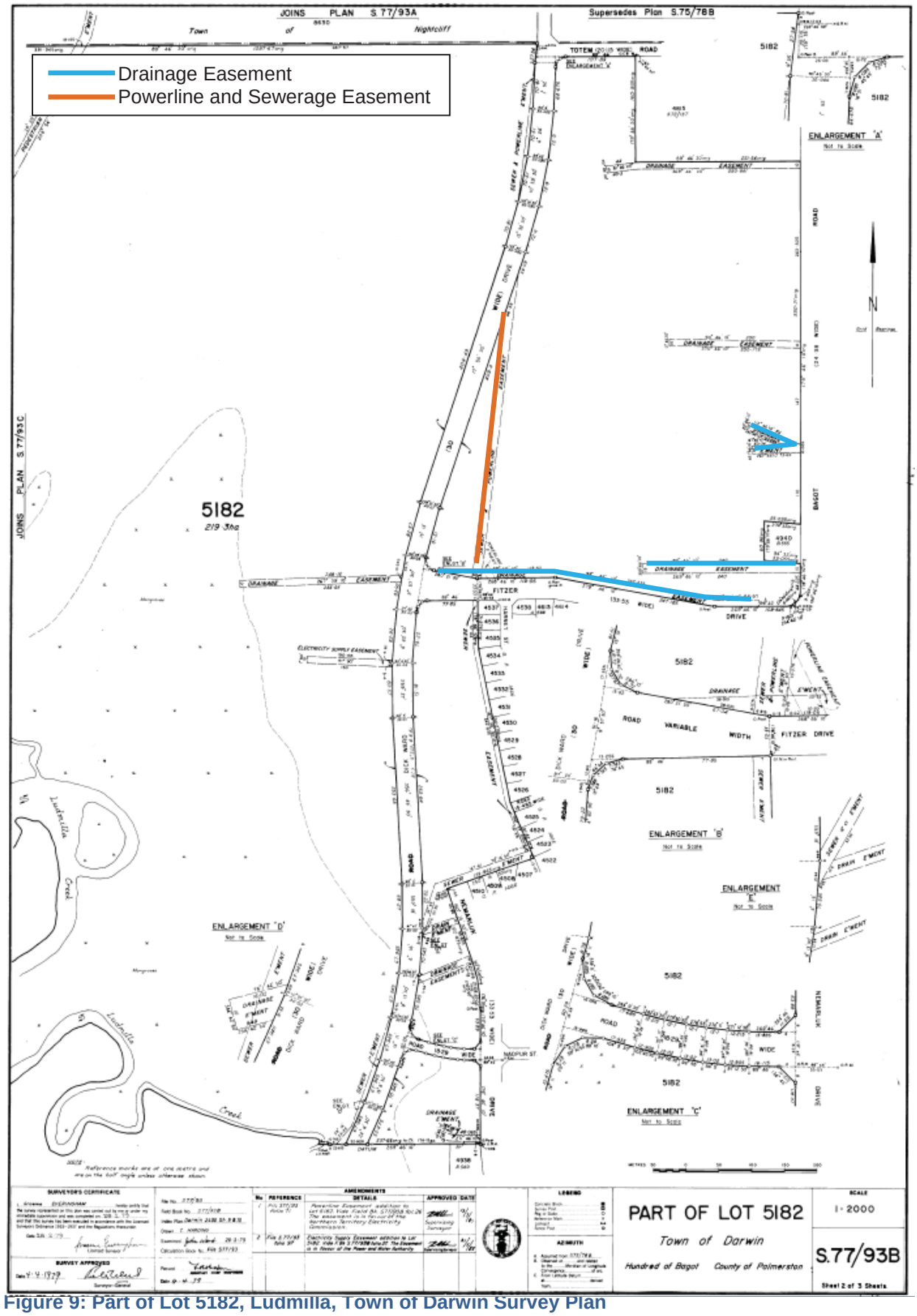


Figure 9: Part of Lot 5182, Ludmilla, Town of Darwin Survey Plan

3.4 Land Use

NRETAS uses Land Use mapping within their assessment process to help in determining:

- the suitability of land use
- environmental impacts
- agricultural productivity
- condition trends

The subject site has been designated as Conservation and Natural Environments land use type (**Figure 10**).

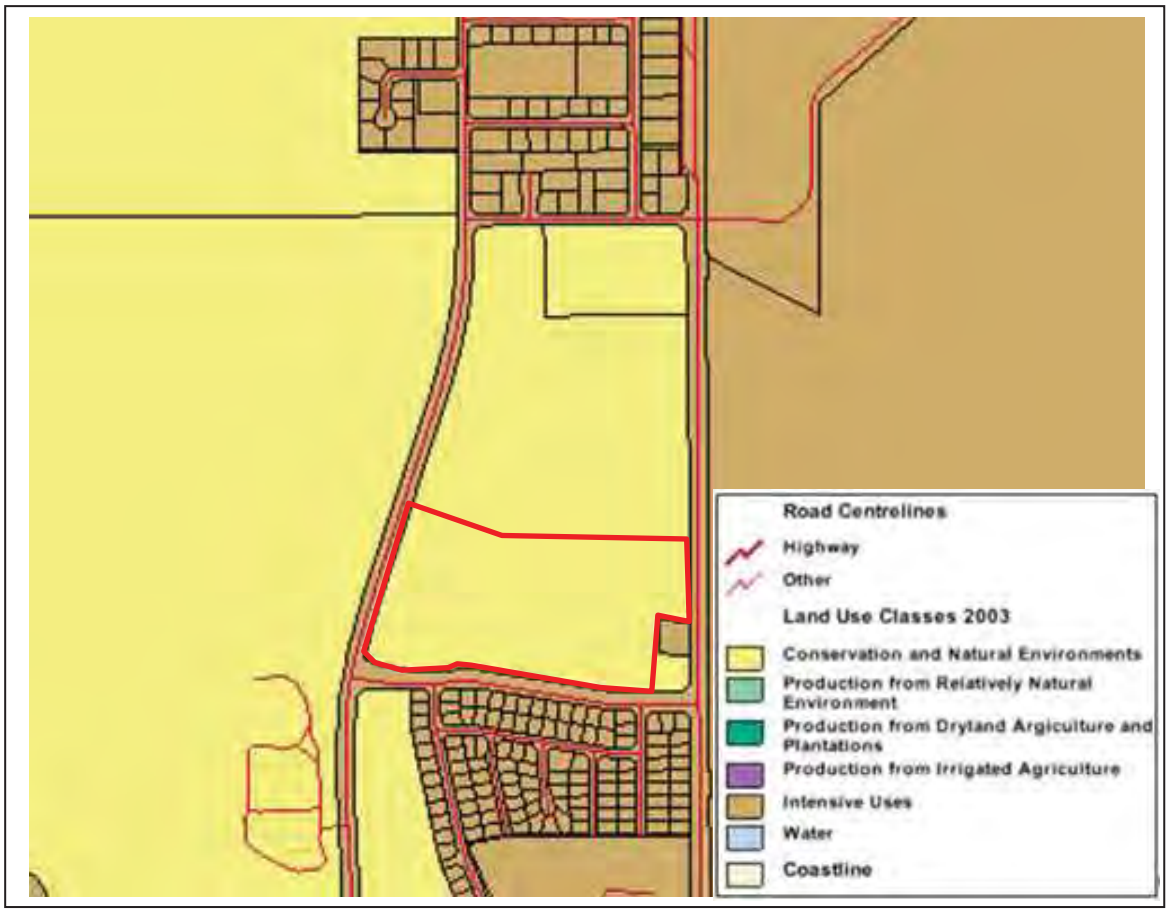


Figure 10: Land Use

3.5 Land Systems

Land Systems present broad scale information used for land management and identifying areas which require further investigation.

The Land System mapping of the Darwin Regional Area is quite coarse, and does not provide good detail for the subject site. The map suggests that the subject site falls within the Koolinpayah Surface: Krans Land System type (**Figure 11**). This land system type is steep dissected terrain forming the edge of the key plateau, in places developed on lower Cretaceous sandstone and shale, and occasionally on underlying Lower Proterozoic sedimentary rocks; shallow lithosols and gravelly yellow massive earths with open forest of tall open forest vegetation types

The Krans Land System type was given a rating of C2 in The Land Systems of the Darwin Region (Wood, Fogarty & Day, 1985) which means it has a moderate capability for urban subdivision with few limitations present.

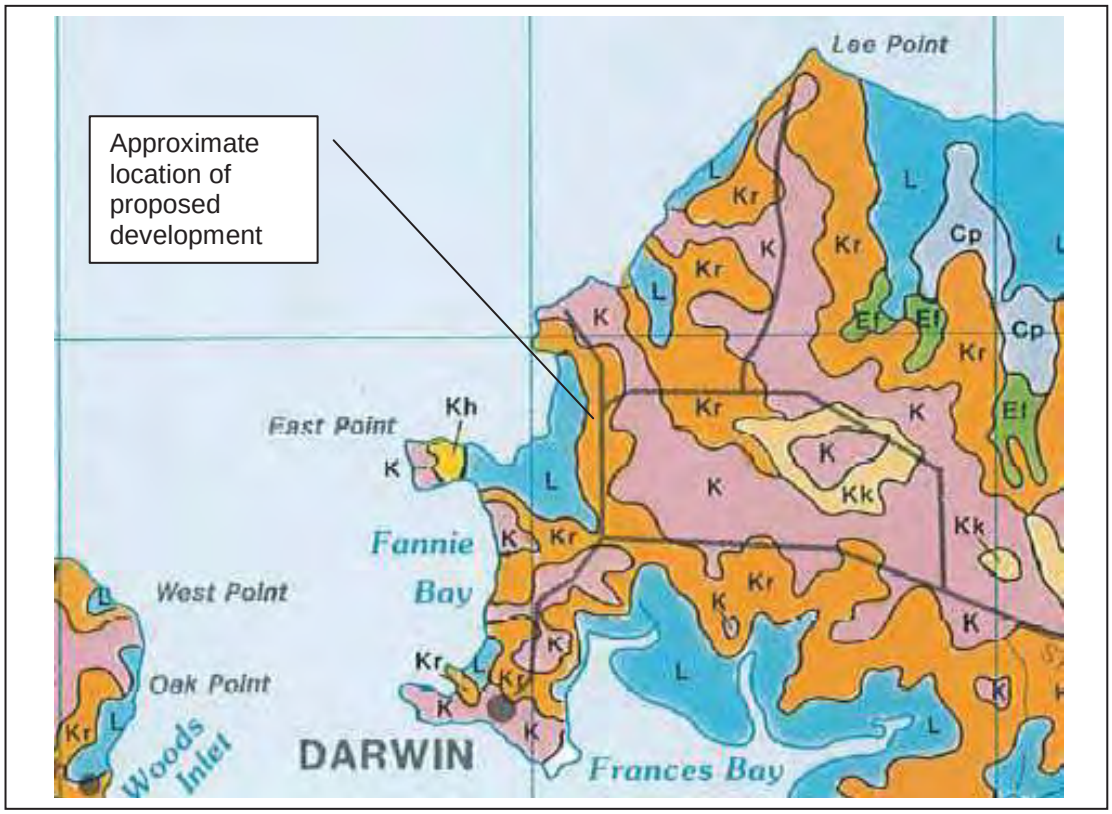


Figure 11: Darwin Land Systems

3.5.1 Land Units

According to NTG information maps, two land units occur within the proposed sub-division (**Figure 12**). Descriptions of these land units are provided in **Table 2** and reflect definitions provided by Fogarty *et al.* 1984, which was remapped by the NT Government in April 2007. Only slight adjustments to the land unit mapping were necessary, and these adjustments are likely due to the 2007 survey being of a finer scale.

Land Unit types 4c accounts for approximately 95% of the site, with the remainder being 6b.The land types are described in **Table 2**.

Table 2: Land Units of the proposed development site and surrounds

Land Unit	Heading	Description	Drainage / Waterlogging Potential	Land Capability Rating for subdivision
4c	Gently Undulating Lower Slopes	Gentle lower slopes; gradient 0.5-1.5; deep mottled grey lateritic earths: Eucalypt Open Woodland, minor Woodland. Slow drainage	Slow, wet season waterlogging, often dry season seepage	Low – moderate capability for urban subdivision with few limitations
6b*	Broad lowland plains	Gradient < 1.5%; shallow to moderately deep siliceous sands: Grevillea / Melaleuca Tall Shrubland to Low Open Woodland, minor Open Woodland	Slow; subject to wet season inundation.	Low for urban subdivision due to site drainage, soil drainage, debil debil surface.

Source Fogarty Lynch and Wood (1984) *NTATLAS online mapping has not been updated to be able to determine if a small part of this land unit type is within site B

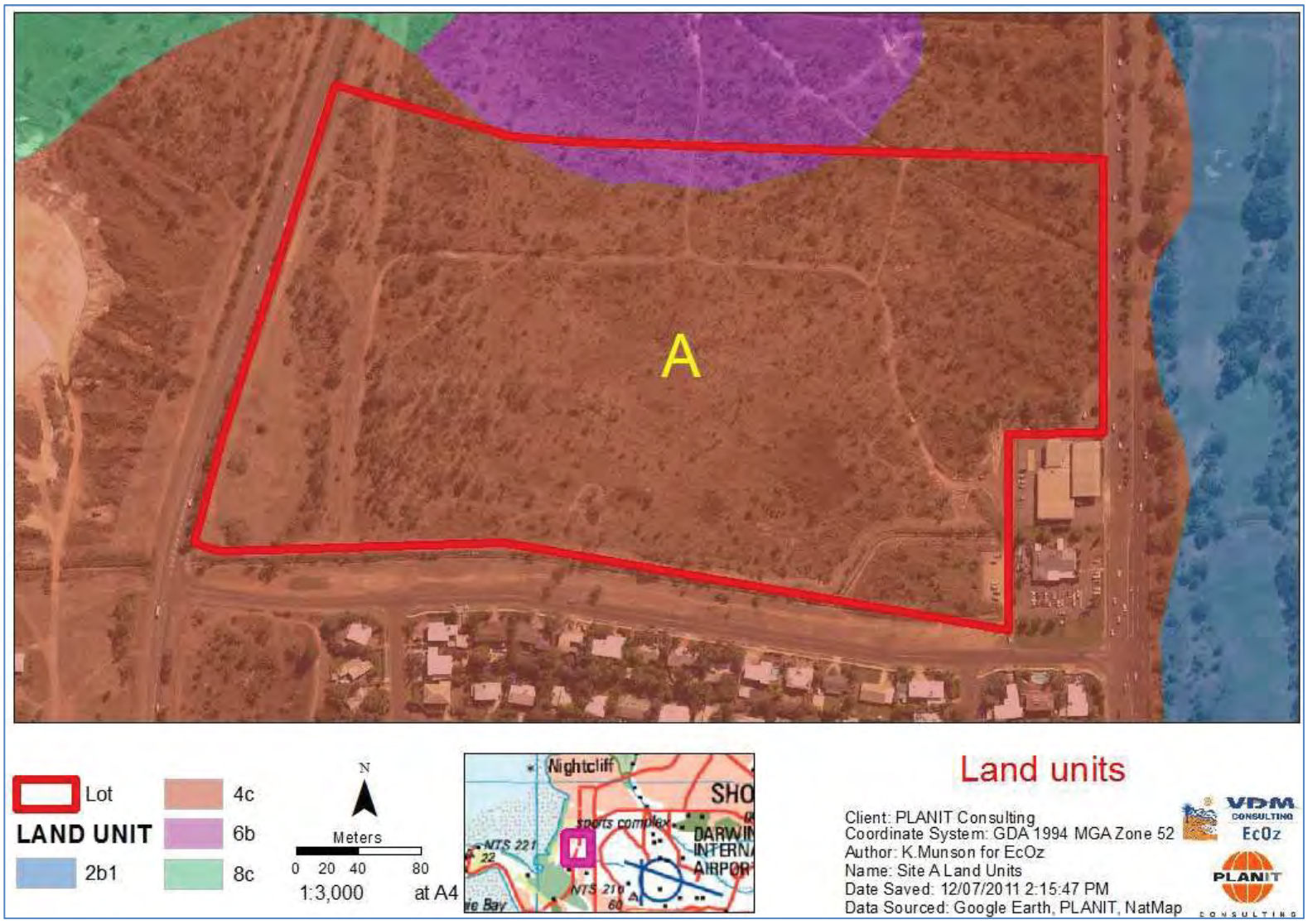


Figure 12: Land Units within and surrounding the proposed development area

3.5.2 Vegetation

The National Vegetation Information System (NVIS, 2005) is a broad scale system that provides information on the extent and distribution of vegetation across Australia. As it is such a broad scale system, NVIS has limited value when looking at a small suburban subdivision such as this; however, it does give some indication as to the general vegetation types to be found on a site.

For **Area A**, NVIS (**Figure 13**) depicts the whole site as being Infrastructure / Agriculture.

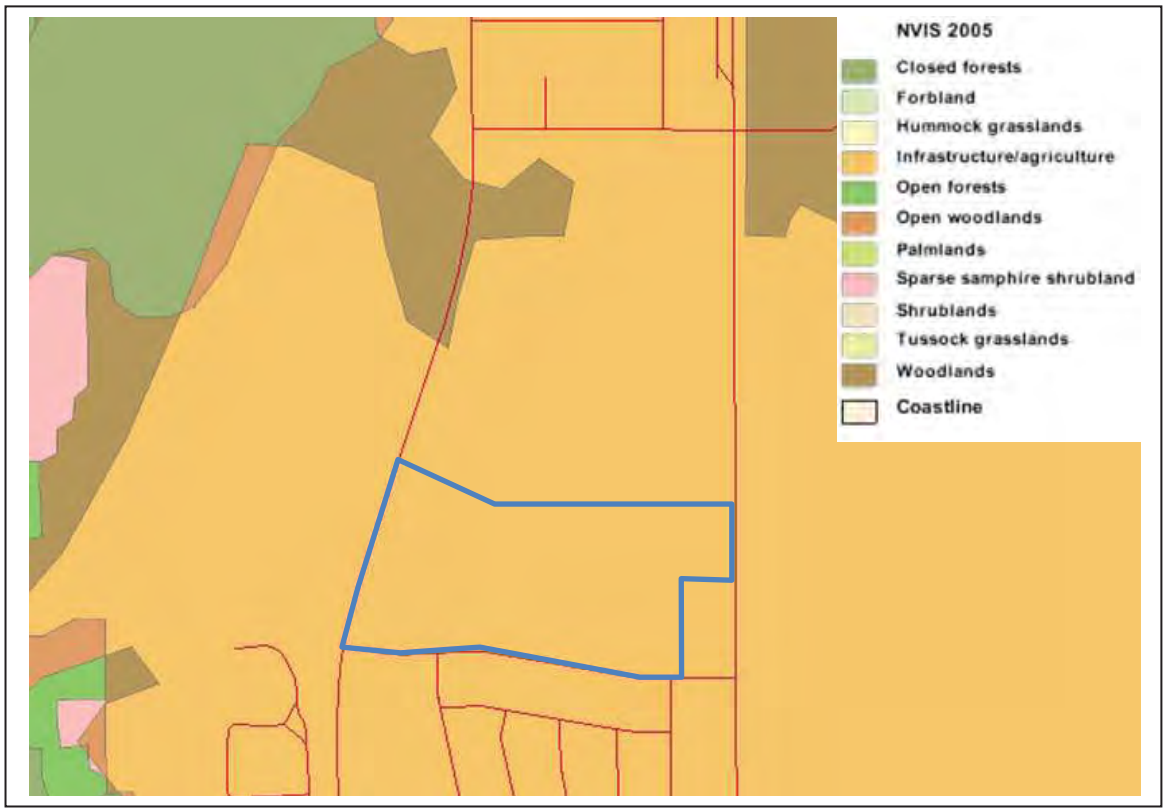


Figure 13: Natural Vegetation Information System

3.5.3 Remnant Vegetation

Remnant Vegetation mapping of the Darwin Municipality suggests there are 2 different vegetation types on the subject site, shown in **Figure 14** and described in **Table 3**.

Table 3: Remnant Vegetation Types on the Proposed Development Site

Remnant Veg type	Community	Description
15	Eucalypt communities	*Eucalyptus tetrodonta, E. Miniata* woodland with mixed species mid stratum and grassland understorey
22	Mixed Species, Woodland to Shrubland	*Eucalyptus clavigera, E. Polycarpa, E. Tectifica* mixed species low woodland to very open low woodland. Understorey mixed species shrubs and grasses

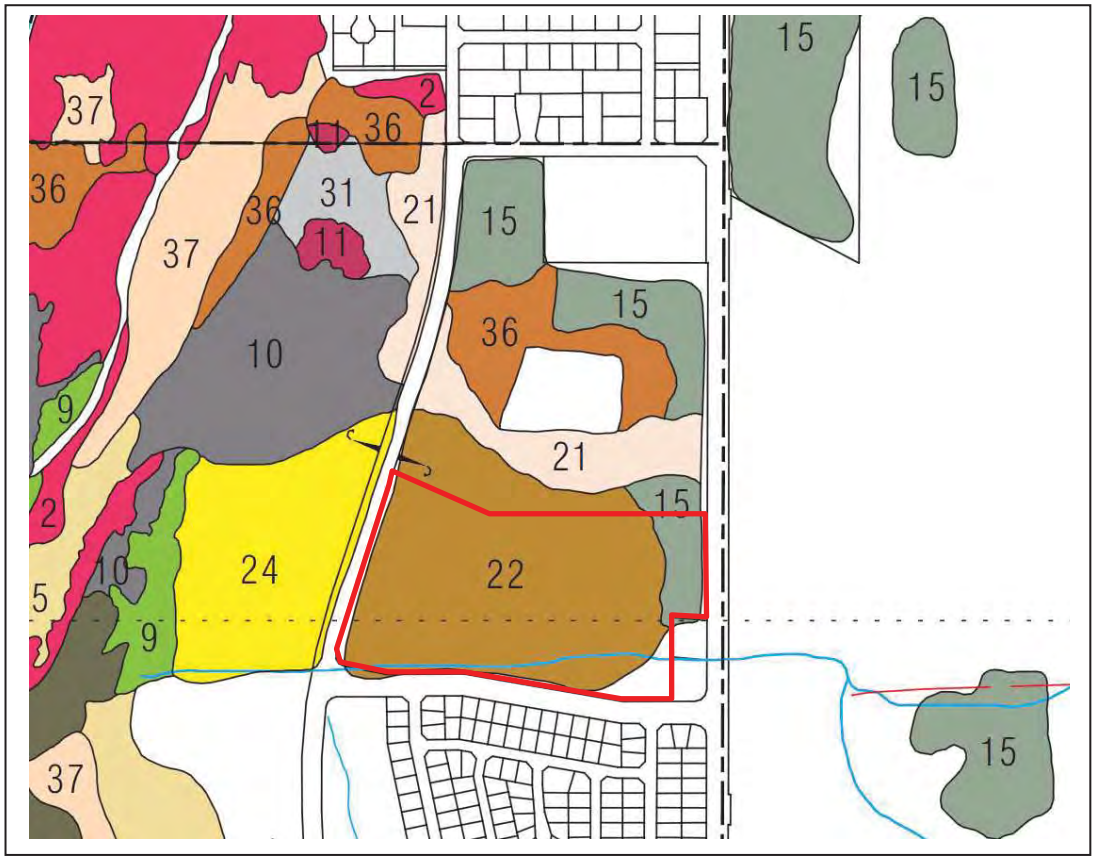


Figure 14: Remnant Vegetation Types within and surrounding the proposed development area

3.6 Site Inspection

3.6.1 Site Description

The subject site was visited by EcOz Environmental Scientists on Thursday 14th July 2011. Parts of the site had been affected by recent fires. The fires generally affected the Eastern and Western boundaries, but had crept towards the centre. This made identification of some ground level species difficult as regrowth was only beginning to show.

The site is fenced on the South, West, and Eastern boundaries, but is open to the **RD** zoned land to the North. **Area A** is accessible via a track at the rear of the adjoining Service Station in the South East of the site. A section of the land (near the eastern boundary) has been cleared to accommodate a power line and sewerage easement. Other areas of the subject site which have been cleared include the south west corner, and the area between the southernmost drainage easement (**Figure 15**) and Fitzer Drive. Since the Google Earth Image (**Fig 18**) was taken, the southernmost cleared area has had some landscaping performed upon it, with grass, trees, and a bicycle path / pedestrian walkway added (**Figure 16**).

Area A has been degraded in several ways. The subject site has been used as a dumping ground for a multitude of items such as:

- Several cars have dumped near the tracks that run through the site;
- Refrigerators, washing machines and other household appliances (**Figure 17**)
- Soil piles and building materials

The site has been heavily impacted by weeds. Gamba Grass and Mission Grass have become the dominant understory species. The land has also been disturbed by:

- Land clearing around easements
- around the tracks throughout the site
- noise created by planes taking off and landing from Darwin Airport
- noise from nearby Dick Ward Drive, and Bagot Road – the main thoroughfares linking Darwin, and the northern suburbs including, Nightcliff, Rapid Creek and Millner amongst others.

Figure 15 Drainage Easements at the south of the Allotment

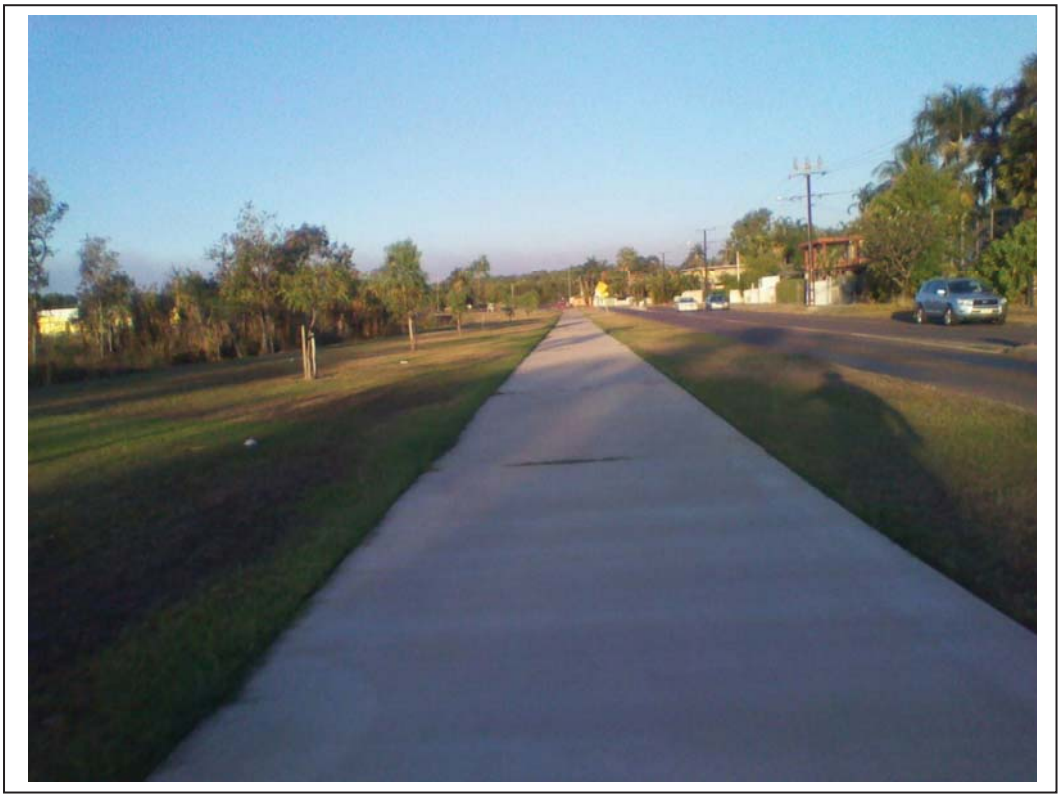


Figure 16 View along Fitzer Drive from the south west corner of Area A

Figure 17 Dumped cars, building materials and soil pile

The remnant vegetation map for the site (**Figure 14**) shows only 2 vegetation communities for the subject site. The field assessment noted 3 main communities with several other areas of cleared land that have been overrun by invasive species. A Google Earth image (**Figure 18**) was used to progress vegetation line work which was later ground-truthed in the field by two EcOz field ecologists. The site vegetation map is provided in **Figure 19**. **Table 4** shows photos and brief description of each vegetation type within the proposed development.

Typical soil cover could not be determined due to recent fire activity on the subject site, which had affected groundcover, and the amount of leaf litter present. There was generally a high laterite gravel cover with sizes from 6mm through to around 80mm. The site was generally flat, with a slope of < 1% towards the east.

There were small areas of *Pandanus spiralis* in the South East corner, between two drainage easements. There were two small areas where Gamba grass was the dominant species in shallow low lying areas, and along the western border of the lot were a row of street trees which appear to have been planted alongside much of Dick Ward Drive

Figure 18 Google Earth image used along with field assessment to produce vegetation map.

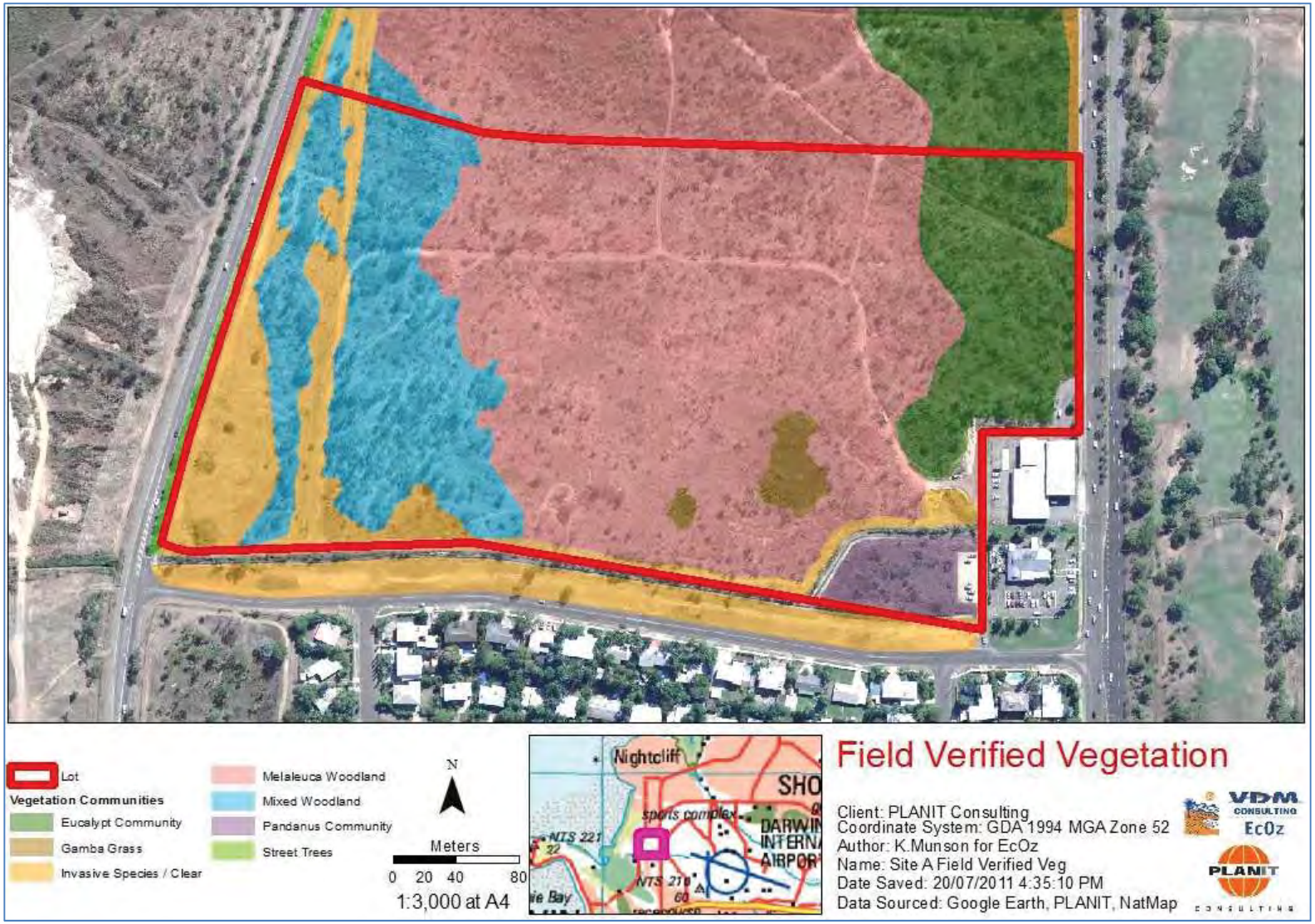
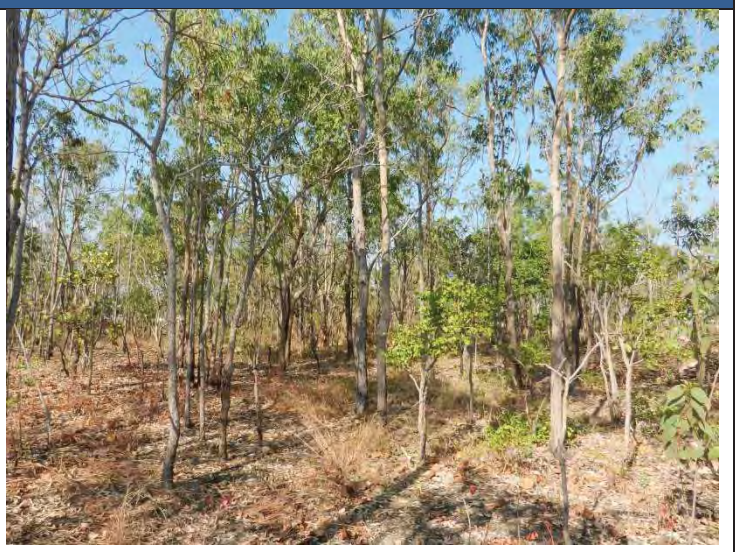


Figure 19 Field verified vegetation map

Table 4 Vegetation Communities at Area A of S D37

Community	Description	Photo
Melaleuca Woodland to open Melaleuca Woodland	*Melaleuca nervosa* dominant upper storey with scattered *Eucalypt polycarpa, E. miniata, Buchanania obovata.* *Pandanus spiralis* dominated mid storey, with *Gardenia megasperma, Grevillea decurrens, & Xanthostemon sp.* Fire had recently been through this area, and the ground storey was harder to identify. Gamba grass appearing to have been the dominant ground species.	 
Eucalypt Forest	*Eucalyptus polycarpa ,E tetrodonta, E. miniata* scattered *Melaleuca nervosa,* Mid storey of *Lophostomen lactifluuis, Livistonia humilis, Grevillea pteridifolia, Acacia spp., Pandanus spiralis,* Gamba grass understorey with fern grasses, *Verticordia cunninghamii, Ectrosia leporina, Eriachne burkitte*	

Community	Description	Photo
		
Classic mixed woodland	*Eucalyptus tetrodonta, E. miniata & Erythrophleum chlorostachys* (iron wood) upper storey with *Persoonia falcata, E. tetrodonta, Corymbia. polycarpa, Grevillia decurrens, Livistonia humilis, Gardenia megasperma, Acacia dimidiata & Buchanania obovata* mid storey Fire impacted. *Andropogon gayanus (*Gamba grass) dominated ground storey with *Buchnera linearis, Petalostigma quadriloculare.*	
Cleared	Cleared areas around easements – mainly Gamba grass covered where not burnt. Cleared area to the south landscaped with grass, street trees, and a bike path.	

3.7 Threatened Species

It is highly unlikely that the proposed development will impact threatened species. An NT INFONET NRM Snapshot for the area around the subject site **(Appendix A)** shows 22 species that are classed as either Vulnerable or Endangered by the Northern Territory or Commonwealth Governments within the grid square that the subject site exists. Eight of those species are marine based species, and will therefore not occur on the site and have been omitted from our table (**Table 5**). The majority of these listed species are unlikely to reside or utilise existing habitat within the subject site due to different habitat requirements, and/or current disturbances within and adjacent to the vegetation communities.

At the subject site Armstrong's Cycad (*Cycas armstrongii),* listed as Vulnerable under the NT *TPWC Act,* was found in most of the habitats and is the only threatened species that will be impacted by the proposed development. Cycads were mostly found within the north eastern section of the development area, with several specimens measuring at over 100cm. However, the cycad density at this site was not high.

Liddle (2009) states that there is concern about the sustainable management of NT cycads due to land clearance and fire regimes as they grow so slowly, and little is known about their ecology. Under the management plan (Liddle, 2009) cycads likely to be destroyed by legitimate development should be salvaged using a clearing permit. These cycads are currently under pressure from fire due to the abundance of Gamba Grass (*Andropogon gayanus)*, and Mission Grass (*Pennisetum polystachyon*) at the development site.

The Darwin Coastal Bioregion Conservation Values and Environmental Resources map shows that two other vulnerable species, the Red Goshawk *(Erythrotriorchis radiatus*) and the Northern Quoll (*Dasyurus hallucatus*) are known to exist in the vicinity of the subject site. The Northern Quoll's preferred habitat consists of rocky escarpment associated with open forest and/or open woodland, which is not supported within the subject site. The Red Goshawk favours coastal and sub coastal tall open forests and woodlands and the edges of rainforest, which does not occur within the subject site. Northern Quolls and Red Goshawks have not been identified in the general areas for many years, despite intensive survey effort by local enthusiasts.

Table 5: Threatened species that may be present in the region

Group	Common Name	Scientific Name	NT Status	National Status
Cycads	Armstrong`s Cycad	*Cycas armstrongii*	VU	.
Insects	Atlas Moth	*Attacus wardi*	EN	
Reptiles	Mertens` Water Monitor	*Varanus mertensi*	VU	
	Yellow-spotted Monitor	*Varanus panoptes*	VU	
Birds	Emu	*Dromaius novaehollandiae*	VU	
	Red Goshawk	*Erythrotriorchis radiatus*	VU	VU
	Australian Bustard	*Ardeotis australis*	VU	
	Australian Painted Snipe	*Rostratula australis*	VU	VU
	Masked Owl	*Tyto novaehollandiae*	EN/VU	EN/VU
	Masked Owl (northern mainland)	*Tyto novaehollandiae kimberli*	VU	VU
	Gouldian Finch	*Erythrura gouldiae*	EN	EN
Mammals	Northern Quoll	*Dasyurus hallucatus*	CR	EN
	Northern Brush-tailed Phascogale	*Phascogale pirata*	VU	
	Bare-rumped Sheath-tailed Bat	*Saccolaimus saccolaimus*		CR

CR = Critically Endangered EN = Endangered VU = Vulnerable DD = Data deficient

3.8 Weed Species

A variety of weeds were identified throughout the property (**Figure18**), and are abundant along the Dick Ward Boundary, as well as alongside tracks which run through the property. The following weed species were identified on site (declared species in bold):

- **Mimosa (*Mimosa pigra)***
- **Gamba Grass (*Andropogon gayanus*)**
- **Perennial Mission Grass (*Pennisetum polystachion*)**

Mimosa pigra has been declared a Weed of National Significance (WoNS), and is declared as Class B and C weed for the Darwin region under the *Weeds Management Act (NT)*. It is a thorny shrub, native to South America, which was introduced to Australia in the 1800s. It can grow in dense stands up to 6m high with little understorey, and one mature plant can produce up to 200,000 seeds per year.

Both the Commonwealth and Northern Territory Governments have released management plans for the control of Mimosa. The 'Mimosa pigra National Best Practice Management Manual' was released by the Commonwealth Government in 2009 and can be found at the following website address:

http://www.nt.gov.au/nreta/natres/weeds/find/mimosa/pdf/introduction.pdf

The NT Government's Weed Management Plan for Mimosa (*Mimosa pigra)* 2010 can be found here:

http://www.nt.gov.au/nreta/natres/weeds/find/mimosa/pdf/mimosa_mgnt_plan_final_oct10.pdf

Gamba grass is declared as a Class B and a Class C weed for the Darwin region, under the *Weeds Management Act (NT).* It is a tall (2-3m) African perennial grass introduced into Australia as a pasture crop. It has since been shown to be a highly invasive weed species that can severely impact the landscapes of the NT (NRETAS 2010). As a Class B weed, the growth and spread of Gamba grass is to be controlled in the area, and as a Class C weed it should not be introduced to any are of the NT (NRETAS 2010).

Gamba grass is a major fire risk. The fuel load of the weed is typically 4 – 7 times greater than native grasses. Gamba grass can burn up to 25 times hotter, and much higher than native grasses (NALM, 2009). This can put mid, and upper storey trees at risk of death by fire which reduces tree canopy cover (Setterfield, *et. al* 2005). Gamba grass will also colonise bare ground quicker than native species after fire has disturbed an area.

Gamba grass is a very invasive weed. Unlike many weed species Gamba grass can establish itself in undisturbed ecosystems, but is also a very effective disturbed area colonizer which will out-compete native species (Setterfield and Douglas, 2007). As of 2010, it was estimated to cover an area of 10-15,000km^2 within a 350km range of Darwin (NRETAS 2010).

The Northern Territory Government released a management plan document for Gamba grass in 2010. The Weed Management Plan for *Andropogon gayanus* (Gamba Grass) sets out best practice techniques to manage the weed in the Northern Territory. All landholders are ***required*** to meet the management objectives outlined in the plan, which can be found at the following address on the NT government's website: http://www.nt.gov.au/nreta/natres/weeds/find/gamba/pdf/FINAL_WMP_GAMBA_GRASS.pdf .

Perennial Mission grass is also declared as a Class B and a Class C weed under the *Weeds Management Act (NT)*, which should not be introduced to anywhere new in the NT, and its current spread should be controlled. It is a native African grass that can grow up to 3m tall, which was introduced into Australia as a pasture species, and has spread across the Top End(GreeningNT 2010)

Mission grass is a large fire risk in the NT. It remains green until late in the dry season and has a fuel load 3-5 times greater than the native grasses it outcompetes (GreeningNT 2010). These factors can cause very hot fires late in the dry season. The species is encouraged by repeated burning, allowing the grass to outcompete native grass species (GreeningNT 2010).

Mission grass is a highly invasive weed. It creates large quantities of seed which can be dispersed by wind, and on animals and vehicles. The species can colonise disturbed, or undisturbed areas, and it can become a risk to the Vulnerable species *Cycas spp.* and endemic shrubs such as *Helicteres spp.*

The Northern Territory Government have produced a fact sheet for Perennial Mission Grass , which details different methods to control the weed species and prevent its spread. This can be found at http://www.nt.gov.au/nreta/natres/weeds/find/pdf/weed_notes_mission_grass_per_mar10.pdf

3.8.1 Weeds: Infonet

The InfoNet search highlighted that 73 weed species have been recorded in the general region of the potential development site. These are listed in the NT NRM Snapshot **(Appendix A)**

Weed management will be required during the construction phase of the development, and as two declared weeds are abundant on the site a specific management plan is recommended. The Weeds Branch of the NTG should be involved in early planning stages to agree on vegetation removal techniques and an appropriate transport and disposal area. The top soil will be highly infested with weed seed, and it is best that this is kept onsite and buried. Gamba Grass and Mission Grass at the site have either seeded or been burnt, therefore chance of vegetation removal containing loose seed is low, however, if vegetation is chosen to be taken offsite we suggest covering the trucks to reduce chance of weed spread. Any cleared vegetation could be mulched onsite and used for future landscaping, or transported to an approved location. All vehicles and machinery that come into contact with vegetation and soil should be washed down prior to leaving the site to ensure that chance of weed spread is minimised.

3.9 Wastes Generated on Site

There is no waste currently generated onsite. The site appears to have been used as a dumping ground. Several cars and various household appliances such as fridges and washing machines have been dumped close to the tracks that run through the property. A lot of building materials (bricks, corrugated iron, concrete etc) have also been dumped. These may require investigation for harmful materials such as asbestos, and safely removed (if required) before further development takes place.

3.10 Current Practices

Several tracks cross the subject site; however in general the land is unimproved. There are several drainage easements generally running in an east-westerly direction as well as a power line and sewerage easement that which runs south-north near the western border of the subject site.

4 Conclusions and Recommendations

The subject site, on part of Lot 5182, Town of Darwin has recently been rezoned from **RD** to **Area A** of **S D37**. **Area A** can generally be considered to be zoned as **SC** – Service Commercial with certain constraints placed upon it.

Soils

Water could be a constraint for the proposed development site. It is mapped as having mainly Kandosols which can be waterlogged during the wet season. Approximately 10% of the site falls within the Secondary Darwin Storm Surge zone. The Land Use and Land Unit mapping suggest that the site has low to moderate suitability for urban subdivision with limitations due to drainage, a high seasonal water table, and a hard setting surface. In order to gain development approval the developer will need to be prepared to adopt appropriate engineering and drainage to make this area suitable for the proposed development for the above issues.

Vegetation

The proposed development site supports 3 distinct vegetation communities, all common within the local region. The proposed development site has been highly disturbed by weeds and by illegally dumped waste. There are sections where Gamba grass and mission grasses are the dominant species. In addition to this the other vegetation types have under storeys including a large proportion of weeds.

Weeds

A weed management plan should be incorporated into a Construction Environmental Management Plan prior as part of the development consent approvals. Weed management onsite (at minimum) should include the following commitments - no soils taken off-site, all cleared grasses and shrubs be piled and buried on-site to a depth of 1m. During the vegetation clearing operation all vehicles should be washed free of vegetation and soil matter. Any earth transported for use onsite should be weed-free. Further requirements for the management of Gamba grass can be found in the Weed Management Plan for '*Andropogon gayanus*' (Gamba Grass) 2010 produced by NRETAS.

Threatened Species

Armstrong's cycad (*Cycas armstrongii,)* was found in low numbers within the northern boundary within the project area, this is listed as vulnerable under the *TPWC Act 2000*. The species is locally abundant, but recognised as vulnerable as its habitat coincides with much of the urban development occurring around the Darwin area. The NT government has produced a cycad management program to provide for the use of these cycads which would otherwise be destroyed through clearing associated with Development. A management plan for the removal of the specimens at the subject site will need to be created in order to receive a permit to move the cycads elsewhere. EcOz can help liaise with local sub-contractors and NT Parks and Wildlife staff to approve translocation of the cycads.

Other species are known to exist within the vicinity of the proposed development site; however none of these will be impacted by the proposed development.

Native title / AAPA / Heritage Search

A full AAPA search should be made to ensure that no sacred sites would be impacted by the proposed development.

A Heritage search showed two prescribed archaeological places and the possibility of further burial places within the boundaries of Lot 5182. Whether these places are located in **Area A** is not clear, however further investigation should be made before further development commences as archaeological places and objects are protected under the *NT Heritage Conservation Act 1991.*

Drainage Channel

The drainage channel which connects to the southern boundary of the property may impact any development. The developer will need to consider the implications of appropriate engineering and drainage to re-route it, or ensure that erosion is not an issue.

Onsite Waste

The site has been used as a general dumping ground for building materials, old cars, and household appliances. The building materials should be investigated for asbestos and, if required, safely removed before further development.

5 References

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Appendix A – NRM INFONET Snapshot

Dick Ward Drive

Dick Ward Drive encompasses an area of 10.1 sq km extending from 12 deg 23.0 min to 12 deg 24.0 min S and 130 deg 50.0 min to 130 deg 52.0 min E.
Dick Ward Drive is located in the Darwin Coastal, bioregion(s)

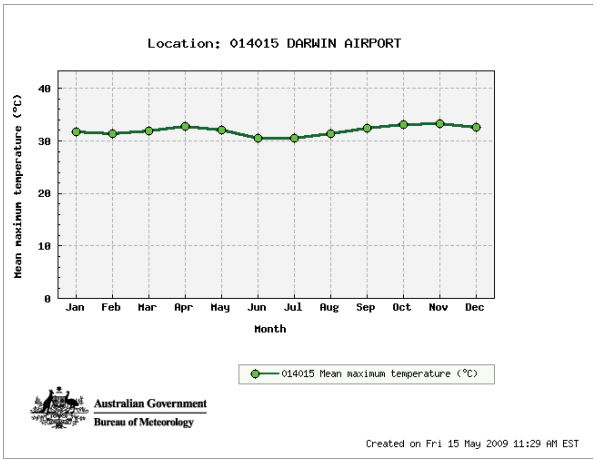
Location of Dick Ward Drive

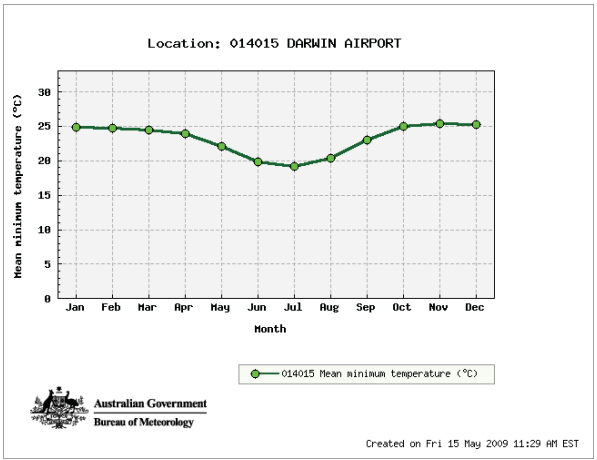
Dick Ward Drive Climate

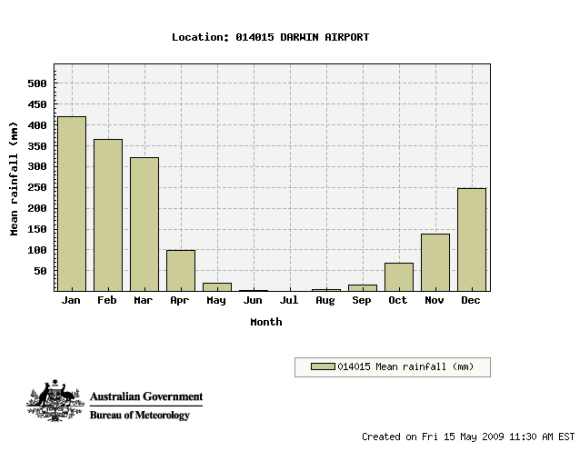
The closest long-term weather station is DARWIN AIRPORT (12 deg 25.0 min S, 130.8925E) 5 km SE of the center of selected area

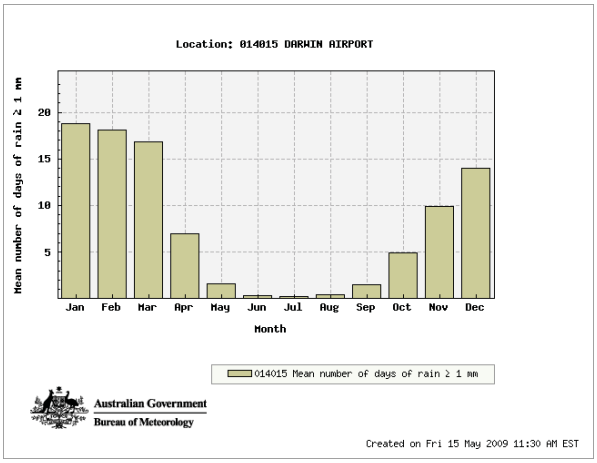
Statistics	Annual Values	Years of record
Mean max temp (deg C)	32.0	68
Mean min temp (deg C)	23.2	68
Average rainfall (mm)	1715.0	68
Average days of rain	93.5	68

Climate summaries from Bureau of Meteorology (www.bom.gov.au)









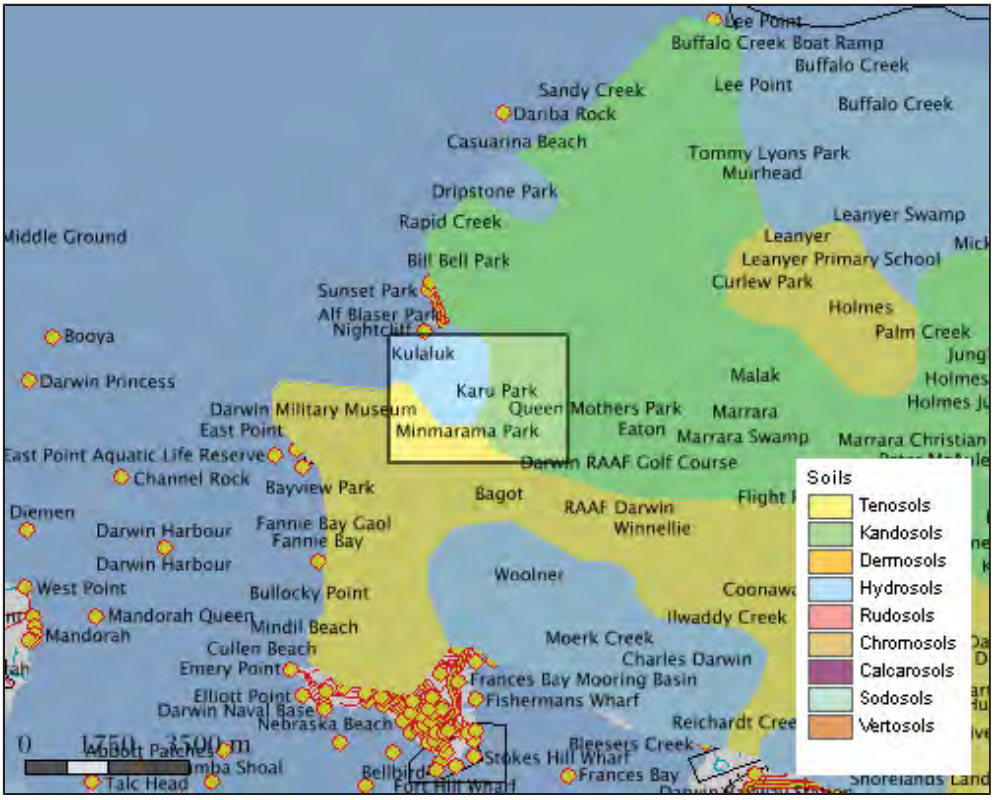
Dick Ward Drive Soils

Soil Types

Area of soil types (Northcote Factual Key)

Selected area is too small to produce reliable statistics

Soil Types

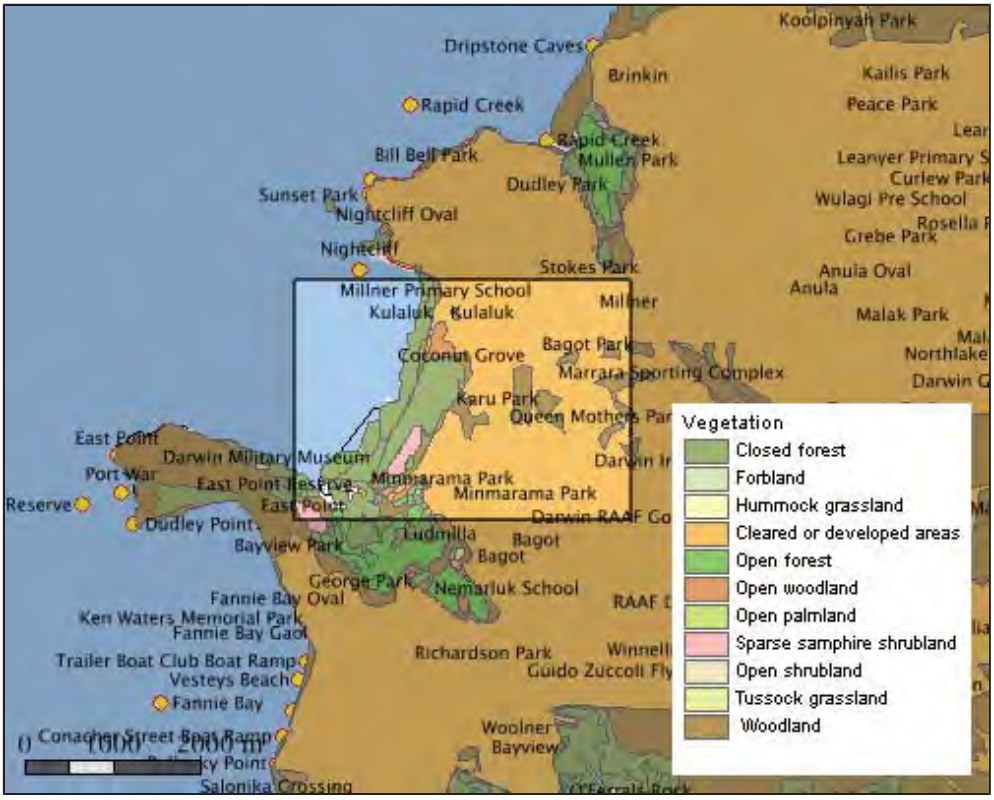


Soils 1:2M Layer is a copy of the NT portion (1:2,000,000 scale dataset) of the CSIRO Atlas of Australian Soils - K.H. Northcote et al. Data scale: 1:2,000,000 ANZLIC Identifier: 2DBCB771205D06B6E040CD9B0F274EFE
More details: Go to www.nt.gov.au/nreta/nretamaps/ and enter the ANZLIC identifier in the Spatial Data Search

Dick Ward Drive Vegetation

Vegetation Communities	Area of vegetation communities
Selected area is too small to produce reliable statistics	

Vegetation Communities



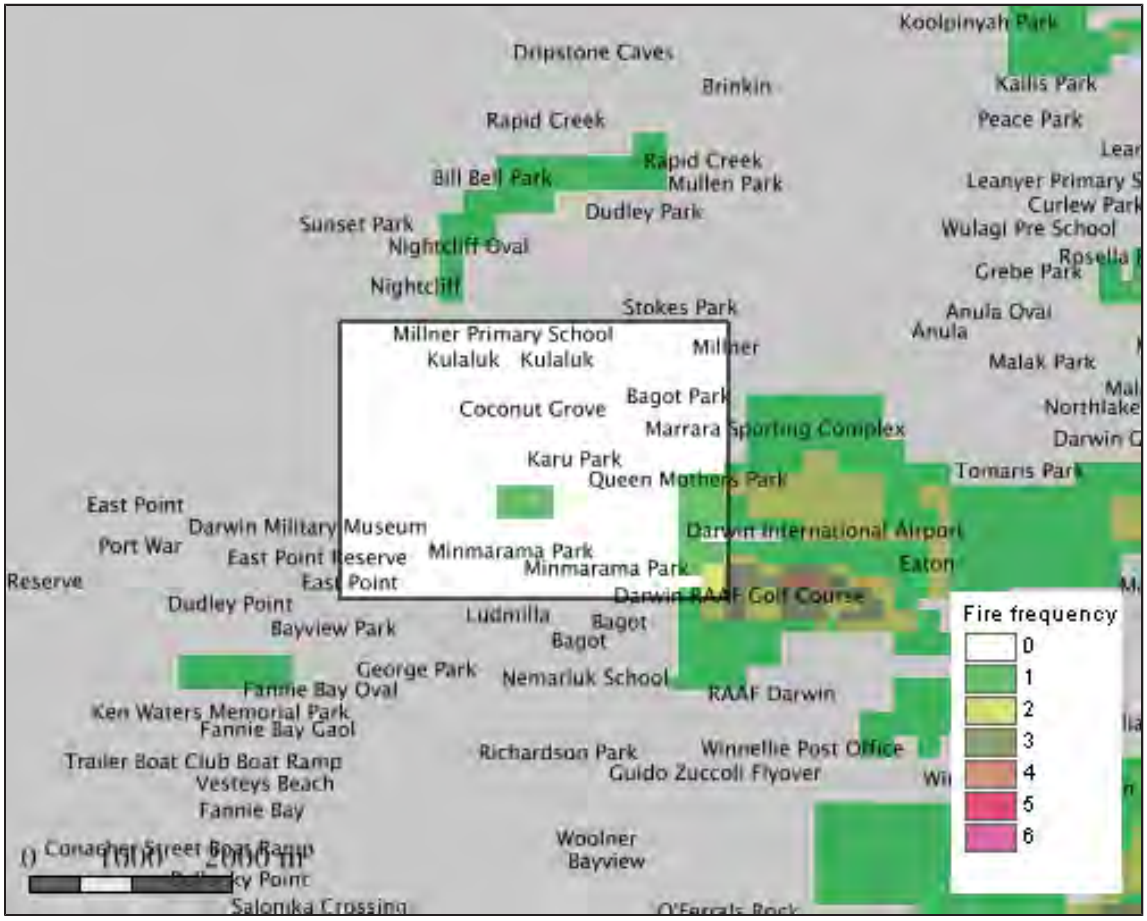
The NVIS 2005 Layer is compiled from a number of vegetation and land unit survey maps that were recoded and re-attributed for the National Vegetation Information System (NVIS)
Data scale variable depending on location. ANZLIC Identifier:2DBCB771207006B6E040CD9B0F274EFE
More details:Go to www.nt.gov.au/nreta/nretamaps/ and enter the ANZLIC identifier in the Spatial Data Search

Dick Ward Drive Fire History

Years burnt 2004-2009 and area burnt in each category

Selected area is too small to produce reliable statistics

Years burnt 2004-2009



The fire frequency(250m) Layer is derived from satellite imagery sourced from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the NASA Terra satellite
Spatial Resolution: 250m x 250m pixels (at Nadir). Extent: NT to approx 19 Deg S only

Dick Ward Drive Threatened Species

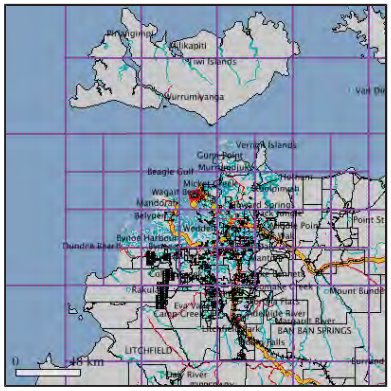
Threatened species recorded in the grid cell(s) in which Dick Ward Drive occurs

Group	Common Name	Scientific Name	NT Status	National Status	ID
Cycads	Armstrong`s Cycad	*Cycas armstrongii*	VU	.	351085
Insects	Atlas Moth	*Attacus wardi*	EN	.	183182
Fish	Dwarf Sawfish	*Pristis clavata*	VU	.	176943
Fish	Green Sawfish	*Pristis zijsron*	VU	VU	176965
Reptiles	Green Turtle	*Chelonia mydas*	.	VU	176291
Reptiles	Hawksbill Turtle	*Eretmochelys imbricata*	.	VU	176298
Reptiles	Olive Ridley	*Lepidochelys olivacea*	.	EN	176305
Reptiles	Flatback Turtle	*Natator depressus*	.	VU	176284
Reptiles	Mertens` Water Monitor	*Varanus mertensi*	VU	.	347295
Reptiles	Yellow-spotted Monitor	*Varanus panoptes*	VU	.	347307
Birds	Emu	*Dromaius novaehollandiae*	VU	.	176363
Birds	Red Goshawk	*Erythrotriorchis radiatus*	VU	VU	176391
Birds	Australian Bustard	*Ardeotis australis*	VU	.	176354
Birds	Australian Painted Snipe	*Rostratula australis*	VU	VU	246428
Birds	Masked Owl	*Tyto novaehollandiae*	EN/VU	EN/VU	177895
Birds	Masked Owl (northern mainland)	*Tyto novaehollandiae kimberli*	VU	VU	594609
Birds	Gouldian Finch	*Erythrura gouldiae*	EN	EN	176370
Mammals	Northern Quoll	*Dasyurus hallucatus*	CR	EN	176443
Mammals	Northern Brush-tailed Phascogale	*Phascogale pirata*	VU	.	177965
Mammals	Bare-rumped Sheath-tailed Bat	*Saccolaimus saccolaimus*	.	CR	177111
Mammals	Blue Whale	*Balaenoptera musculus*	DD	EN	233883
Mammals	Humpback Whale	*Megaptera novaeangliae*	DD	VU	280686

EX = Extinct EW = Extinct in the Wild ER= Extinct in the NT EN = Endangered
EN/VU = One Endangered subspecies/One Vulnerable subspecies
VU=Vulnerable
VU/- = One or more subspecies vulnerable EN/- = One or more subspecies endangered

More species info: Go to www.landmanager.org.au/view/index.aspx?id=####
where #### is the ID number from the tables above for the species of interest.

Species listed in the table above were recorded from all the grid cells shown below (red/blue line) that overlap Dick Ward Drive



Dick Ward Drive Weeds and Potential Weeds

Introduced plants recorded in the grid cell(s) in which Dick Ward Drive occurs and that have been identified as problem weeds in one or more locations in northern Australia. Occurence based on Department of Natural Resources, Environment and The Arts databases.

Common Name	Scientific Name	NT Status	National Status	Other Status	ID
African Mahogany	*Khaya senegalensis*	.	.	*C&E*	361295
African Tulip Tree	*Spathodea campanulata*	.	.	*Q3 WeedsAus*	292854
American Rat`s Tail Grass	*Sporobolus jacquemontii*	.	.	*Q2 G&M*	292904
Awnless Barnyard Grass	*Echinochloa colona*	.	.	*DEU*	290114
Barleria	*Barleria prionitis*	*A C*	*ALERT*	*MP K2 C&E G&M*	288734
Bellyache Bush	*Jatropha gossypiifolia*	*B C*	.	*K2 WA1 WA4 Q2 C&E G&M CYP DEU*	113957
Bitter Broom	*Scoparia dulcis*	.	.	*DEU*	292424
Blue Trumpet Vine	*Thunbergia grandiflora*	.	.	*Q2 C&E CYP*	293124
Branched Porterweed	*Stachytarpheta australis*	*B C*	.	.	361505
Calopo	*Calopogonium mucunoides*	.	.	*MP C&E CYP*	288904
Caltrop	*Tribulus terrestris*	*B C*	.	*CYP SA*	361555
Candle Bush	*Senna alata*	*B C*	.	*WA1 WA2*	292444
Caribbean Stylo	*Stylosanthes hamata*	.	.	*DEU*	292974
Cayenne Snakeweed	*Stachytarpheta cayennensis*	*B C*	.	*NSW*	292924
Centro	*Centrosema molle*	.	.	*MP*	289184
Cinderella Weed	*Synedrella nodiflora*	.	.	*C&E*	293024
Clustering Fishtail Palm	*Caryota mitis*	.	.	*C&E WeedsAus*	361015
Coast Morning Glory	*Ipomoea cairica*	.	.	*NSW*	290774
Coffee Bush	*Leucaena leucocephala*	.	.	*MP C&E G&M CYP*	290894
Columbus Grass	*Sorghum almum*	.	.	*NSW*	361495
Common Sensitive Plant	*Mimosa pudica*	*C*	.	*WA1 WA2*	291294
Common Sensitive Plant	*Mimosa pudica var. hispida*	*C*	.	*WA1 WA2*	291294
Common Stylo	*Stylosanthes guianensis*	.	.	*DEU*	292964
Cow Itch	*Mucuna pruriens var. utilis*	.	*ALERT*	*NAQS C&E*	291384
Creeping Wood-sorrel	*Oxalis corniculata*	.	.	*NSW*	291584
Cupid`s Flower	*Ipomoea quamoclit*	.	.	*C&E*	371932
Fierce Thornapple	*Datura ferox*	*A C*	.	*WA1 WA3 WA4 G&M*	289904
Flannel Weed	*Sida cordifolia*	*B C*	.	*WA1 G&M DEU*	292594
Fringed Spiderflower	*Cleome rutidosperma*	.	.	*NAQS Gr*	289494
Gamba Grass	*Andropogon gayanus*	*A C*	.	*MP K1 Q2 WA2 C&E G&M CYP*	179446
Gambia Pea	*Crotalaria goreensis*	.	.	*MP*	183442
Golden Shower	*Cassia fistula*	.	.	*WeedsAus*	289034
Gomphrena Weed	*Gomphrena celosioides*	.	.	*DEU*	290514
Grader Grass	*Themeda quadrivalvis*	*B C*	.	*G&M CYP DEU*	107883
Guinea Grass	*Megathyrsus maximus*	.	.	*MP DEU*	291184
Hyptis	*Hyptis suaveolens*	*B C*	.	*G&M*	290734
Indian Bluegrass	*Bothriochloa pertusa*	.	.	*DEU*	288804
Indian Heliotrope	*Heliotropium indicum*	.	.	*DEU*	290584
Ivy Gourd	*Coccinia grandis*	.	.	*WA1 WA2 C&E*	289524
Jamaican Snakeweed	*Stachytarpheta jamaicensis*	*B C*	.	.	292924
Jaragua Grass	*Hyparrhenia rufa*	.	.	*G&M*	290694
Lantana	*Lantana camara*	*B C*	*WONS*	*K2 WA1 Q3 Gr G&M CYP DEU NSW SA*	237738
Mexican Clover	*Richardia brasiliensis*	.	.	*DEU*	292244
Mimosa	*Mimosa pigra*	*A (S of 14 deg S) B (N of 14 deg S) C*	*WONS*	*MP K2 WA1 WA2 Q1 G&M CYP SA*	291304
Mission Grass (annual)	*Pennisetum pedicellatum*	.	.	*WeedsAus*	291864
Mission Grass (perennial)	*Pennisetum polystachion*	*B C*	.	*MP K2 C&E G&M*	291884
Mission Grass (perennial)	*Pennisetum polystachion subsp. polystachion*	*B C*	.	*MP K2 C&E G&M*	291884
Mission Grass (perennial)	*Pennisetum polystachion subsp. setosum*	*B C*	.	*MP K2 C&E G&M*	291884

Common Name	Scientific Name	NT Status	National Status	Other Status	ID
Mossman River Grass	*Cenchrus echinatus*	*B C*	*.*	*NSW*	289124
Mother-In-Law`s Tongue	*Sansevieria trifasciata*	*.*	*.*	*C&E CYP*	292384
Nutgrass	*Cyperus rotundus*	*.*	*.*	*DEU SA*	289844
Paddy`s Lucerne	*Sida rhombifolia*	*B C*	*.*	*MP G&M DEU*	292604
Para Grass	*Urochloa mutica*	*.*	*.*	*MP G&M*	293304
Parkinsonia	*Parkinsonia aculeata*	*B C*	*WONS*	*MP K2 WA1 WA4 Q2 G&M CYP DEU NSW SA*	114160
Pink Periwinkle	*Catharanthus roseus*	*.*	*.*	*C&E*	289064
Purpletop Chloris	*Chloris barbata*	*.*	*.*	*DEU*	289314
Rangoon Creeper	*Quisqualis indica*	*.*	*.*	*C&E*	292204
Red Natal Grass	*Melinis repens*	*.*	*.*	*DEU*	291224
Rhodes Grass	*Chloris gayana*	*.*	*.*	*DEU*	289334
Roadside Leafbract	*Malachra fasciata var. lineariloba*	*.*	*.*	*CYP*	361325
Sabi Grass	*Urochloa mosambicensis*	*.*	*.*	*DEU*	293294
Shoe-button	*Ardisia elliptica*	*.*	*.*	*C&E*	288544
Shrubby Stylo	*Stylosanthes scabra*	*.*	*.*	*G&M DEU*	292994
Sicklepod	*Senna obtusifolia*	*B C*	*.*	*WA1 WA2 Q2 G&M CYP DEU*	131903
Singapore Daisy	*Sphagneticola trilobata*	*.*	*.*	*Q3 C&E CYP*	292884
Siratro	*Macroptilium atropurpureum*	*.*	*.*	*C&E*	291024
Soft Lovegrass	*Eragrostis pilosa*	*.*	*.*	*DEU*	372338
Spearpod	*Ruellia tuberosa*	*.*	*.*	*C&E*	292314
Spiny Amaranth	*Amaranthus spinosus*	*.*	*.*	*WA1 WA2*	288384
Spiny Sida	*Sida spinosa*	*.*	*.*	*DEU*	292614
Spiny-head Sida	*Sida acuta*	*B C*	*.*	*WA1 G&M*	292584
Starburr	*Acanthospermum hispidum*	*B C*	*.*	*.*	288214
Townsville Lucerne	*Stylosanthes humilis*	*.*	*.*	*DEU*	292984

Status Codes:

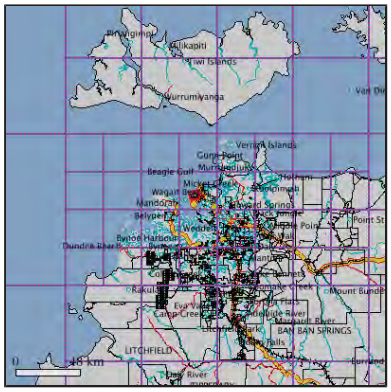
1. NATIONAL STATUS CODES
WONS, Weeds of National Significance
Alert, Alert List for Environmental Weeds (Please call Exotic Plant Pest Hotline 1800 084 881 if you think you have seen this weed)
Sleeper, National Sleeper Weed
Target,Targeted for eradication. (www.landmanager.com.au/view/index.aspx?id=449837)

2. NT STATUS CODES
A, NT Class A Weed (to be eradicated)
B, NT Class B Weed (growth & spread to be controlled)
C, NTClass C Weed (not to be introduced) (www.landmanager.com.au/view/index.aspx?id=449869)

3. OTHER STATUS CODES
C&E, Csurhes, S. & Edwards, R. (1998) Potential Environmental Weeds in Australia. Candidate Species for Preventative Control. Environment Australia, Canberra (www.landmanager.com.au/view/index.aspx?id=394504)
CYP, Draft Cape York Peninsula Pest Management Plan 2006-2011 (www.landmanager.com.au/view/index.aspx?id=371200)
DEU, Plants listed as environmental weeds by the Desert Uplands Strategic Land Resource Assessment (www.landmanager.com.au/view/index.aspx?id=332123)
G&M, Grice AC, Martin TG. 2005. The Management of Weeds and Their Impact on Biodiversity in the Rangelands. Cooperative Research Centre (CRC) for Australian Weed Management and CSIRO Sustainable Ecosystems. Commonwealth Australia (www.landmanager.com.au/view/index.aspx?id=163572)
Gr, Groves et al. 2003. Weed categories for natural and agricultural ecosystem management. Bureau of Rural Sciences (www.landmanager.com.au/view/index.aspx?id=388018)
K0, High Priority Weeds not yet established in the Katherine region
K1, High Priority Weeds posing environmental threats in the Katherine region
K2, High Priority Weeds posing existing threats in the Katherine region, as described in the Katherine Regional Weed Management Strategy 2005-2010 (www.landmanager.com.au/view/index.aspx?id=130286)
MP, Northern Territory Parks & Conservation Masterplan (www.landmanager.com.au/view/index.aspx?id=144141)
NAQS, North Australian Quarantine Strategy Target List (www.landmanager.com.au/view/index.aspx?id=449416)
NSW, Declared Noxious Weed in NSW (www.landmanager.com.au/view/index.aspx?id=449983)
Q1, QLD Class 1 Weed (not to be introduced, kept or supplied-
Q2, Class 2 Weed (eradicate where possible, not to be introduced, kept or supplied)
Q3, Qld Class 3 Weed (to be controlled near environmentally sensitive areas- not to be supplied/sold without a permit) (www.landmanager.com.au/view/index.aspx?id=190714)
SA, Declared Plant in South Australia (www.landmanager.com.au/view/index.aspx?id=449996)
WeedsAus, Listed as a significant weed by Weeds Australia (www.landmanager.com.au/view/index.aspx?id=14576)
WA1,WA Weed Class P1 (movement prohibited)
WA2, WA Weed Class P2 (aim to eradicate)
WA3, WA Weed Class P3 (control infestations)
WA4, WA Weed Class P4 (prevent spread)
WA5, WA Weed Class P3 (control infestations on public land) (www.landmanager.com.au/view/index.aspx?id=449884).

More species info: Go to www.landmanager.org.au/view/index.aspx?id=####
where #### is the ID number from the tables above for the species of interest.

Plants listed in the table above were recorded from all the grid cells shown below (red/blue line) that overlap Dick Ward Drive



Dick Ward Drive Pest and Potential Pest Animals

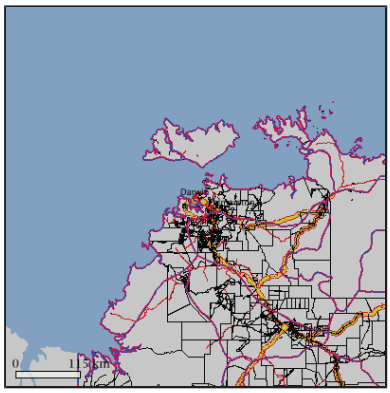
Animals with pest potential recorded in the bioregion(s) in which Dick Ward Drive occurs. Occurence based on Department of Natural Resources, Environment and The Arts databases.

Common Name	Scientific Name	NT Status	National Status	ID
Cane Toad	*Chaunus marinus*	P	.	183252
Asian House Gecko	*Hemidactylus frenatus*	P	.	188964
Flower-pot Blind Snake	*Ramphotyphlops braminus*	P	.	189084
King Quail	*Excalfactoria chinensis*	P	.	450567
Rock Dove	*Columba livia*	P	.	183336
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii*	N	.	223765
Sulphur-Crested Cockatoo	*Cacatua galerita*	N	.	223772
Common Starling	*Sturnus vulgaris*	P	.	188980
House Sparrow	*Passer domesticus*	P	.	183322
Eurasian Tree Sparrow	*Passer montanus*	P	.	450580
Agile Wallaby	*Macropus agilis*	N	.	223786
House Mouse	*Mus musculus*	P	.	187720
Black Rat	*Rattus rattus*	P	.	183236
Dingo / Wild dog	*Canis lupus*	N	.	183280
Cat	*Felis catus*	P	.	183259
Donkey	*Equus asinus*	P	.	183287
Horse	*Equus caballus*	P	.	183315
Pig	*Sus scrofa*	P	.	183329
Swamp Buffalo	*Bubalus bubalis*	P	.	183245
Cattle	*Bos indicus / Bos taurus*	P	.	183266

NT STATUS CODES:
P, Prohibited species (all exotic vertebrates except those listed as non-prohibited (www.landmanager.com.au/view/index.aspx?id=450509)
Int, Introduced species (all non-prohibited vertebrates, and all other exotic species (www.landmanager.com.au/view/index.aspx?id=280771)
N, Native species with pest potential.

More species info: Go to www.landmanager.org.au/view/index.aspx?id=####
where #### is the ID number from the tables above for the species of interest.

Potential pest animals listed in the table above were recorded from the bioregions shown below (red/blue line) that overlap Dick Ward Drive



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