Bernie

P.O. Box 4
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EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

30th March 2009
ST/st
FILE: 23(2)

Main Roads
PO Box 6185
Cairns Qld 4871

Attention: personal information

Dear Sir,

re: Gravel Investigation - 53/92C/302 - Gulf Developmental Road

At your request, an investigation has been carried out into an existing gravel resource on the Undara Road. A backhoe was used for all test pits excavated, with each pit being logged for depth and a GPS reading taken. Limited sampling was carried out and all test pits were filled in.

Undara Pit

This area is located approximately 4 kms down the Undara Road. Access is through an existing track. Several GPS locations supplied by Main Roads were checked for depth and quality. It was found that these locations were inside the old worked areas, and although there were indications of some remaining material, the quality was found to be variable. It is not recommended that these areas be re-worked as a source for Base gravel.

A new area was found and investigated at the southern-most extent of the gravel resource. This area has some native light tree and grass coverage. Depths of gravel range from 0.4m to 1.3m with 100mm to 400mm of overburden. The floor is weathered granite rock and the test pits were dug to refusal by the backhoe, but it is predicted that greater depths could be achieved with heavier equipment. The gravel is generally a Type 3.3 "D" grading with varying plasticity and shrinkage. **CBR** results ranged from **50** to **64**. See Grid sheet JX for GPS locations and depths and Reports JY,JZ,KA,KB,KC and KD and for gravel quality results.

There are several small rocky outcrops in the pit area so it is recommended that an excavator be used to win approx. **11,000 to 14,000m3.** There will be a quantity of oversize as well as some tree roots in the deposit and it is recommended that the material is power-screened before carting to the road. This process has also been shown to be beneficial in not only homogenising the gravel, but also allowing the rippable weathered granite from the floor to be included which can greatly improve the grading characteristics and quality and quantity.

If you require any further details or assistance, please contact this office.

Yours faithfully,
EARTHTECH LABORATORIES NQ

NR
personal information

MANAGER

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EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	**Main Roads**	Report No:	**KD**
Project:	**Gravel Investigation 53/92C/002**	Job No:	**23(4)**
Location:	Undara Pit	Date tested:	24/3/09
Date sampled:	19/3/09	Tested by:	ST
Sampled by:	ST	Checked by:	ST

CALIFORNIA BEARING RATIO TEST REPORT

Q113C

Sample No	28/09	29/09	30/09	31/09	32/09
Source	POI 330	POI 332	POI 334	POI 335	POI 337
Sample description	Deco Ridge Gravel	Deco Ridge Gravel	Deco Ridge Gravel	Deco Ridge Gravel	Deco Ridge Gravel

Compaction Method: **Q110A**

Compactive effort	Standard (2.7 kg/300 mm) 53 blows		3 layers		
MDD t/m3	1.944	1.925	1.990	1.977	1.890
OMC %	11.0	11.5	10.4	10.6	12.0

CBR Test Details Target Density Ratio % 100

Before Soaking Target Moisture % of Optimum 100

Dry density t/m3	1.937	1.926	1.980	1.973	1.896
Density ratio %	99.6	100.1	99.5	99.8	100.3
Moisture content %	11.2	11.5	10.5	11.0	11.9

After Soaking

Dry density t/m3	1.937	1.926	1.980	1.973	1.898
Density ratio %	99.6	100.1	99.5	99.8	100.4
Moisture content %	12.9	13.1	12.0	12.4	13.6
Days soaked	4	4	4	4	4
Swell %	0	0	0	0	0.1

Moisture Content After Penetration

Top 40 mm %	12.0	12.5	11.0	11.5	13.1
Whole sample %	11.9	12.2	10.9	11.0	12.9

California Bearing Ratio

2.5 mm	46	36	42	54	52
5.0 mm	52	50	58	64	54
Reported CBR	**52**	**50**	**58**	**64**	**54**

Preliminary results issued: *

Remarks: Sample taken as per AS 1289.1.2.1

Date: 29-3-09

Approved Signatory: NR
STEVE TURNER

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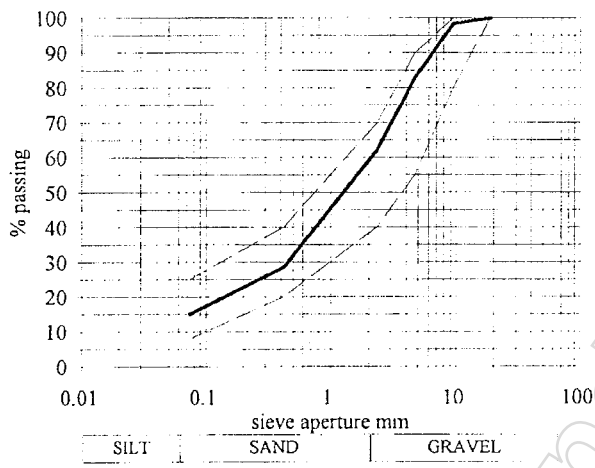
EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	Main Roads Cairns	Report No:	KC
Project:	53/92C/002	Job No:	23(4)
Location:	Undara Pit	Sample No:	32/09
Date sampled:	19/3/09	Date tested:	20/3/09
Sampled by:	ST	Tested by:	ST
Sample source:	Poi 337	Checked by:	ST
Sample description:	Unbound Pavement Material		

PARTICLE SIZE DISTRIBUTION TEST REPORT Q103A



Sieve Size mm	% Passing	Specification Limits MRS 11.05 D grading	
37.5	100	100	100
19.0	100	100	100
9.5	98	80	100
4.75	83	55	90
2.36	62	40	70
0.425	28	20	40
0.075	15	8	25

ATTERBERG LIMITS TEST REPORT

		Limits MRS 11.05 Type 3.2	Type 3.3
Liquid Limit (1)	38.4	28	35
Plastic Limit (2)	23.2		
Plasticity Index (3)	15.2	8	12
Linear Shrinkage (4)	6.8	4.5	6.5
Fines Ratio	0.53	0.35- 0.65	0.35 - 0.65
PI x -0.425 mm	433	200	360
LS x -0.425 mm	194	110	195

Test Methods

1: Q104D - Liquid Limit (Cone Penetrometer)
2: Q105 - Plastic Limit and Plasticity Index
3: Q105 - Plastic Limit and Plasticity Index
4: Q106 - Linear Shrinkage

Remarks: Sampled as per AS1289.1.2.1 cl 6.5.4

Preliminary result issued:

FILE: QPRO\RPT\Q103A,104,105,106

issue 1/08

Date: 27.3.09

Approved Signatory: NR
STEVE TURNER

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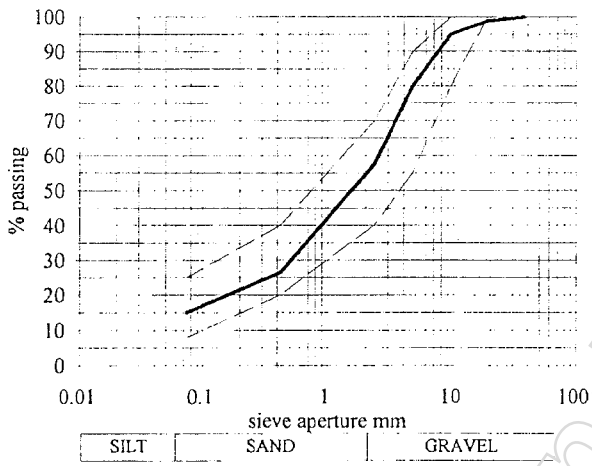
EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	**Main Roads Cairns**	Report No:	**KB**
Project:	**53/92C/002**	Job No:	**23(4)**
Location:	Undara Pit	Sample No:	31/09
Date sampled:	19/3/09	Date tested:	20/3/09
Sampled by:	ST	Tested by:	ST
Sample source:	Poi 335	Checked by:	ST
Sample description:	Unbound Pavement Material		

PARTICLE SIZE DISTRIBUTION TEST REPORT Q103A



Sieve Size mm	% Passing	Specification Limits MRS 11.05 D grading	
37.5	**100**	100	100
19.0	**99**	100	100
9.5	**95**	80	100
4.75	**80**	55	90
2.36	**58**	40	70
0.425	**26**	20	40
0.075	**15**	8	25

ATTERBERG LIMITS TEST REPORT

		Limits MRS 11.05 Type 3.2	Type 3.3
Liquid Limit (1)	**35.4**	28	35
Plastic Limit (2)	**23.6**		
Plasticity Index (3)	**11.8**	8	12
Linear Shrinkage (4)	**6.4**	4.5	6.5
Fines Ratio	**0.57**	0.35- 0.65	0.35 - 0.65
PI x -0.425 mm	**312**	200	360
LS x -0.425 mm	**169**	110	195

Test Methods

1: Q104D - Liquid Limit (Cone Penetrometer)
2: Q105 - Plastic Limit and Plasticity Index
3: Q105 - Plastic Limit and Plasticity Index
4: Q106 - Linear Shrinkage

Remarks: Sampled as per AS1289.1.2.1 cl 6.5.4

Preliminary result issued:

FILE: QPRO\RPT\Q103A,104,105,106 issue 1/08

Date: 27-3-09

Approved Signatory: NR
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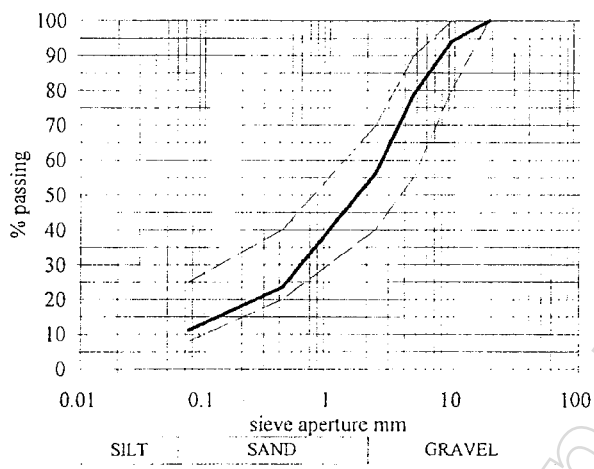
EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	**Main Roads Cairns**	Report No:	**KA**
Project:	**53/92C/002**	Job No:	**23(4)**
Location:	Undara Pit	Sample No:	30/09
Date sampled:	19/3/09	Date tested:	20/3/09
Sampled by:	ST	Tested by:	ST
Sample source:	Poi 334	Checked by:	ST
Sample description:	Unbound Pavement Material		

PARTICLE SIZE DISTRIBUTION TEST REPORT Q103A



Sieve Size mm	% Passing	Specification Limits MRS 11.05 D grading	
37.5	**100**	100	100
19.0	**100**	100	100
9.5	**94**	80	100
4.75	**79**	55	90
2.36	**56**	40	70
0.425	**24**	20	40
0.075	**11**	8	25

ATTERBERG LIMITS TEST REPORT

		Limits MRS 11.05 Type 3.2	Type 3.3
Liquid Limit (1)	**31.2**	28	35
Plastic Limit (2)	**26.0**		
Plasticity Index (3)	**5.2**	8	12
Linear Shrinkage (4)	**4.6**	4.5	6.5
Fines Ratio	**0.48**	0.35- 0.65	0.35 - 0.65
PI x -0.425 mm	**122**	200	360
LS x -0.425 mm	**108**	110	195

Test Methods

1: Q104D - Liquid Limit (Cone Penetrometer)
2: Q105 - Plastic Limit and Plasticity Index
3: Q105 - Plastic Limit and Plasticity Index
4: Q106 - Linear Shrinkage

Remarks: Sampled as per AS1289.1.2.1 cl 6.5.4

Preliminary result issued:

FILE: QPRO\RPT\Q103A,104,105,106 issue 1/08

Date: 27-3-09

Approved Signatory: NR
STEVE TURNER

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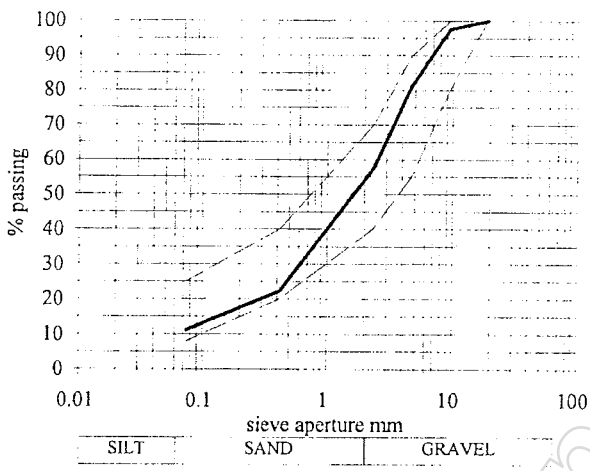
EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	Main Roads Cairns	Report No:	JZ
Project:	53/92C/002	Job No:	23(4)
Location:	Undara Pit	Sample No:	29/09
Date sampled:	19/3/09	Date tested:	20/3/09
Sampled by:	ST	Tested by:	ST
Sample source:	Poi 332	Checked by:	ST
Sample description:	Unbound Pavement Material		

PARTICLE SIZE DISTRIBUTION TEST REPORT Q103A



Sieve Size mm	% Passing	Specification Limits MRS 11.05 D grading	
37.5	**100**	100	100
19.0	**100**	100	100
9.5	**98**	80	100
4.75	**81**	55	90
2.36	**57**	40	70
0.425	**22**	20	40
0.075	**11**	8	25

ATTERBERG LIMITS TEST REPORT

		Limits MRS 11.05 Type 3.2	Limits MRS 11.05 Type 3.3
Liquid Limit (1)	**36.2**	28	35
Plastic Limit (2)	**26.2**		
Plasticity Index (3)	**10.0**	8	12
Linear Shrinkage (4)	**5.2**	4.5	6.5
Fines Ratio	**0.50**	0.35- 0.65	0.35 - 0.65
PI x -0.425 mm	**223**	200	360
LS x -0.425 mm	**116**	110	195

Test Methods

1: Q104D - Liquid Limit (Cone Penetrometer)
2: Q105 - Plastic Limit and Plasticity Index
3: Q105 - Plastic Limit and Plasticity Index
4: Q106 - Linear Shrinkage

Remarks: Sampled as per AS1289.1.2.1 cl 6.5.4

Preliminary result issued:

FILE: QPRO\RPT\Q103A,104,105,106

issue 1/08

Date: 27-3-09

Approved Signatory: NR
STEVE TURNER

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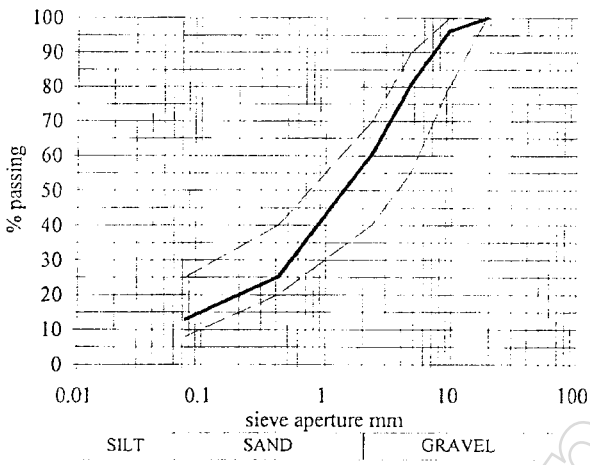
EARTHTECH LABORATORIES (NQ)

Soils and Engineering Materials Testing

Client:	**Main Roads Cairns**	Report No:	**JY**
Project:	**53/92C/002**	Job No:	**23(4)**
Location:	Undara Pit	Sample No:	28/09
Date sampled:	19/3/09	Date tested:	20/3/09
Sampled by:	ST	Tested by:	ST
Sample source:	Poi 330	Checked by:	ST
Sample description:	Unbound Pavement Material		

PARTICLE SIZE DISTRIBUTION TEST REPORT Q103A



Sieve Size mm	% Passing	Specification Limits MRS 11.05 D grading	
37.5	**100**	100	100
19.0	**100**	100	100
9.5	**96**	80	100
4.75	**81**	55	90
2.36	**61**	40	70
0.425	**25**	20	40
0.075	**13**	8	25

ATTERBERG LIMITS TEST REPORT

		Limits MRS 11.05 Type 3.2	Limits MRS 11.05 Type 3.3
Liquid Limit (1)	**37.8**	28	35
Plastic Limit (2)	**29.6**		
Plasticity Index (3)	**8.2**	8	12
Linear Shrinkage (4)	**6.2**	4.5	6.5
Fines Ratio	**0.52**	0.35- 0.65	0.35 - 0.65
PI x -0.425 mm	**207**	200	360
LS x -0.425 mm	**157**	110	195

Test Methods

1: Q104D - Liquid Limit (Cone Penetrometer)
2: Q105 - Plastic Limit and Plasticity Index
3: Q105 - Plastic Limit and Plasticity Index
4: Q106 - Linear Shrinkage

Remarks: Sampled as per AS1289.1.2.1 cl 6.5.4

Preliminary result issued:

FILE: QPRO\RPT\Q103A,104,105,106 issue 1/08

NATA This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO / IEC 17025.

Date: 27-3-09

Approved Signatory: NR
STEVE TURNER

Undara Pit

Sample No.	28/09	29/09	30/09	31/09	32/09				
Location	POI 330	POI 332	POI 334	POI 335	POI 337				
Sieve Size mm									
75.0									
53.0									
37.5				100					
19.0	100	100	100	99	100				
9.5	96	98	94	95	98				
4.75	81	81	79	80	83				
2.36	61	57	56	58	62				
0.425	25	22	24	26	28				
0.075	13	11	11	15	15				
Liquid Limit	37.8	36.2	31.2	35.4	38.4				
Plasticity Index	8.2	10.0	5.2	11.8	15.2				
Linear Shrinkage	6.2	5.2	4.6	6.4	6.8				
Fines Ratio	0.52	0.50	0.48	0.57	0.53				
PI x -0.425 mm	207	223	122	312	433				
LS x -0.425 mm	157	116	108	169	194				
Soaked CBR	**52**	**50**	**58**	**64**	**54**				
Unsoaked CBR									

Gravel Pit Details

UTM WGS84

client: Main Roads

Report No: JX

project: Gravel Investigation 53/92C/002

job no: 23

location: **Undara Pit**

date : 19/3/09

sample description: Ridge Gravel

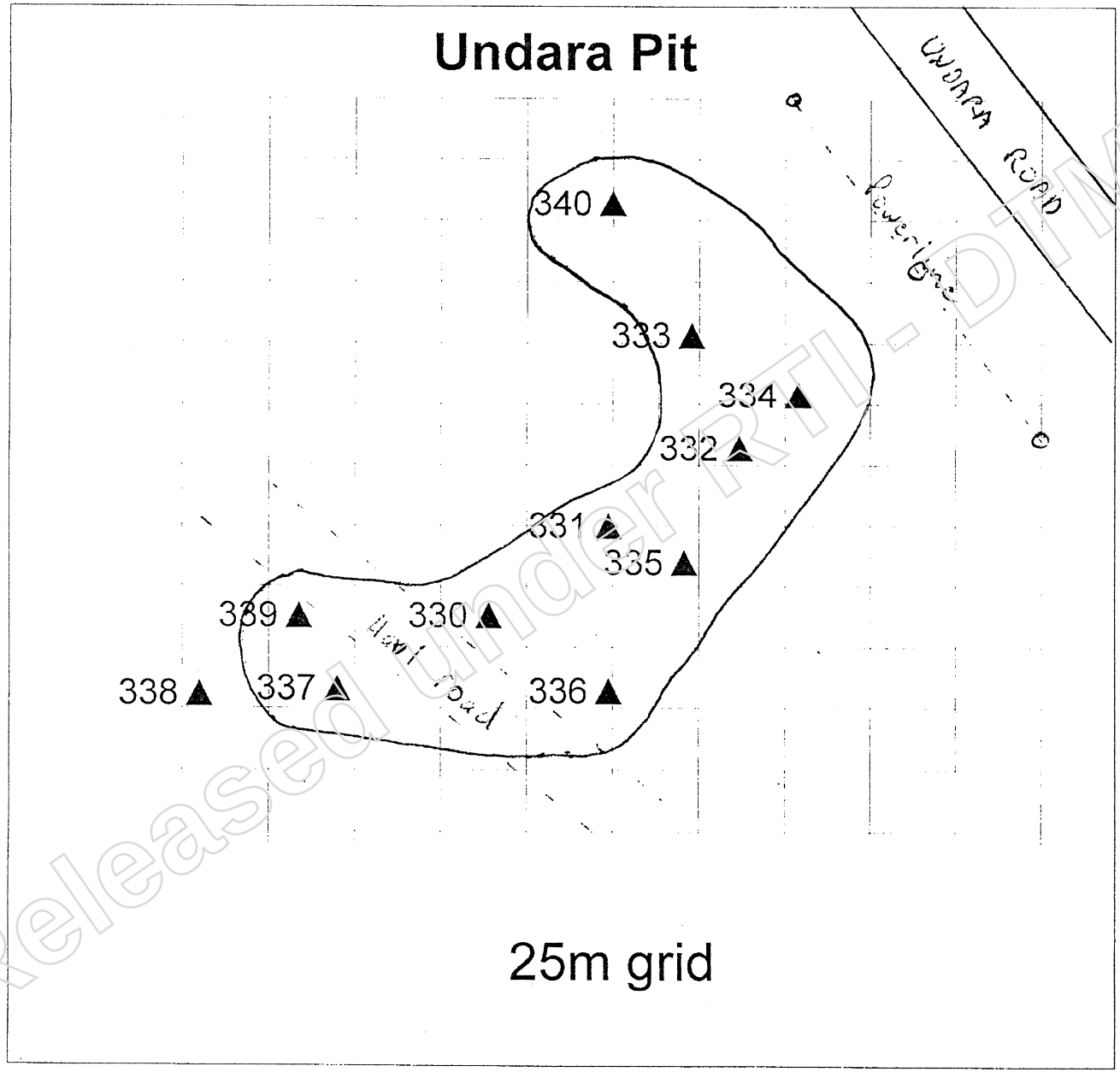
sampled by: ST

Position No.	POI 330	POI 331	POI 332	POI 333	POI 334	POI 335
GPS E	55249339	55249374	55249412	55249398	55249429	55249396
N	7989613	7989650	7989682	7989728	7989704	7989635
Overburden mm	400	100	200	100	200	200
Gravel mm	1000	700	900	700	1000+	1300+
Termination mm	1400	800	1100	800	1200+	1500+
Floor type	granite rock	granite rock	granite rock	granite rock	granite rock	granite rock
Sample No:	28/09		29/09		30/09	31/09

Position No.	POI 336	POI 337	POI 338	POI 339	POI 340	
GPS E	55249374	55249295	55249255	55249284	55249375	
N	7989582	7989583	7989581	7989613	7989782	
Overburden mm	200	200	100	200	100	
Gravel mm	500	1000+	Clay	500	400	
Termination mm	700	1200+	500	700	500	
Floor type	granite rock	granite rock		granite rock	granite rock	
Sample No:		32/09				

Position No.						
GPS E						
N						
Overburden mm						
Gravel mm						
Termination mm						
Floor type						
Sample No:						

indicates little or no usefull gravel



Gulf Dev. Road - Undara Gravel Resource Area (92C_002)

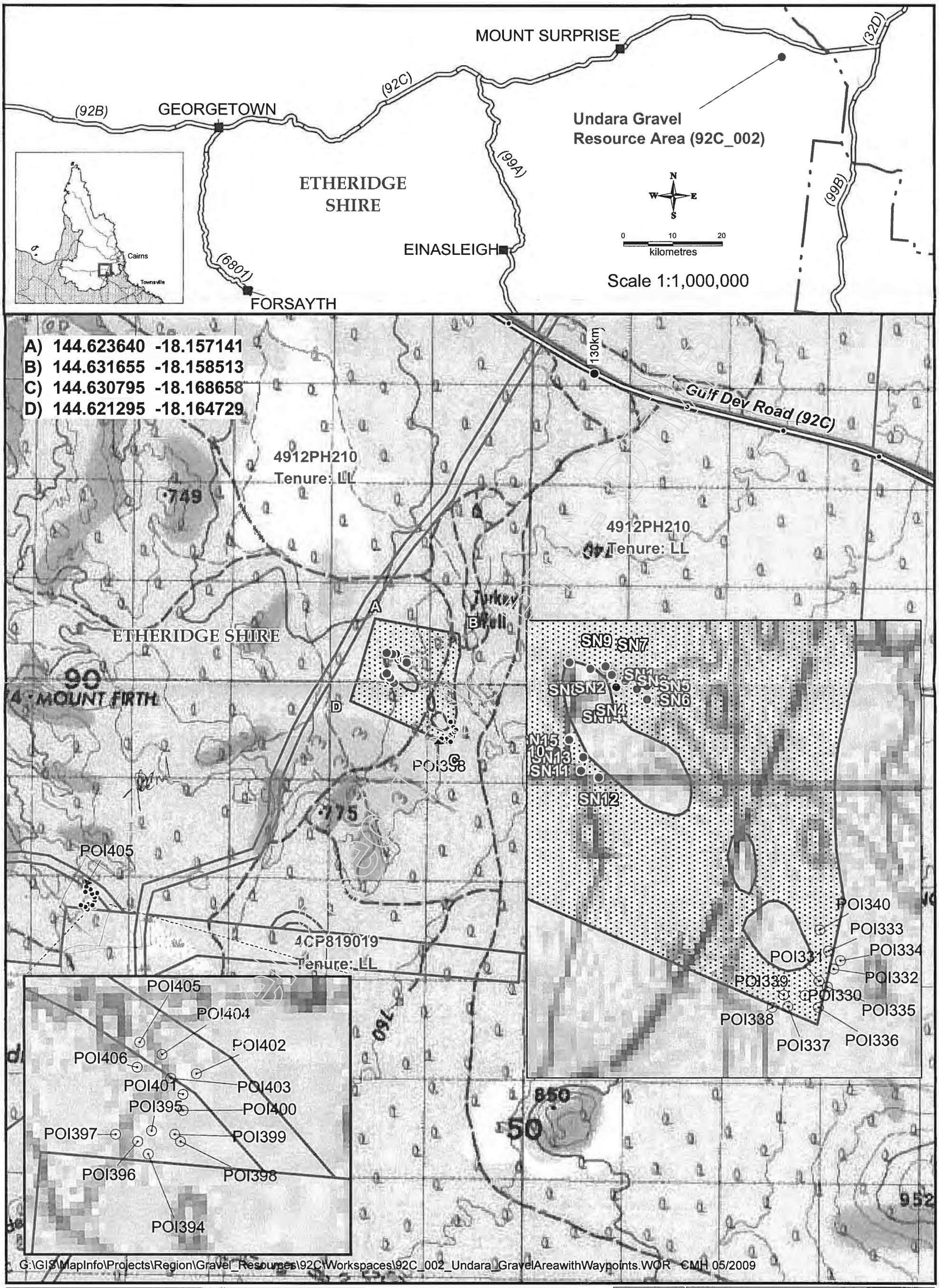


Figure 1. Location Map

Scale: 1:50,000

GDA

Queensland Government

REVIEW OF ENVIRONMENTAL FACTORS (PLANNING)

Gulf Developmental Road
Undara Resource Area (92C_002)
[59/92C/302, 303 & 304]

Prepared by	Paul Graham
Title	Senior Environmental Officer
Branch	Transport Planning, Peninsula District
Division	Department of Main Roads
Location	Floor 6, 15 Lake Street, Cairns QLD 4870
Version no.	0.1
Version date	March 2009
Status	Final
DMS ref. no.	

Document control sheet

Contact for enquiries and proposed changes

If you have any questions regarding this document or if you have a suggestion for improvements, please contact:

Contact officer Paul Graham

Title Senior Environmental Officer

Phone (07) 4050 5528

Version history

Version no.	Date	Changed by	Nature of amendment
Draft	March 09	Paul Graham	Initial draft.
Final	March 09	Paul Graham	Editing of initial draft to final document

Document sign off

The following officers have **approved** this document.

Customer

Name Peter McNamara

Position M/CM

Signature NR Date 26/3/09

Sponsor

Name Stephen Ung

Position C/CTS

Signature NR Date 26/3/09

The following officer has **endorsed** this document.

Name Ron Michel

Position A/RD

Signature NR Date 26/03/09

Contents

Cover: A view of the Undara National Park turnoff from the Gulf Developmental Road.

1 SUMMARY

1.1 Background

LOCAL GOVERNMENT: Etheridge Shire

PROJECT NUMBER: 59/92C/302, 303 & 304

LOCATION: One existing pit, located 17.1km to the west of the intersection of the Kennedy Developmental and Gulf Developmental Roads (GDR) and south of the GDR, was appraised as part of this environmental assessment of the Undara Resource Area. Specifically, the resource area (RA) is located approximately 3km southwest of the Gulf Developmental Road and adjacent to the Undara access road.

PROJECT DESCRIPTION: Gravel from the above-mentioned RA will be used to augment construction materials for upgrade of the GDR by way of shoulder widening, overlay and seal.

1.2 Study Area for Review of Environmental Factors

The Environmental Services Unit (ESU) for Main Roads Far North Region has undertaken this Review of Environmental Factors (REF). The study area for the REF encompasses the Undara Resource Area, as shown on Figures 1 and 2. The geographic coordinates for the study area are also detailed on the attached Gravel Pit Environmental Assessment Sheet in Section 1.6.

Note that on the location map, the areas without coloured shading have been removed from the RA and no gravel extraction shall occur in these areas. These *no-go* areas without shading are located within 50m of 1st & 2nd order streams and granitic rocky outcrops that contains the Regional Ecosystem 9.12.36 (NOC).

The desktop assessments and rapid botanical assessments for this REF were undertaken in February 2009. At the time of the inspections the site was wet and well grassed. The study area is utilised for low intensity grazing. However, several kilometres to the south and east of the RA is the Undara National Park. This conservation area is widely renown for the crater and lava tubes which are of considerable geological and biological significance.

The rationale behind setting aside such a large RA for gravel extraction is to allow flexibility in the selection of the operational pit should resource quality, environmental constraints, cultural heritage or other management issues render part of the proposed operational area unsuitable.

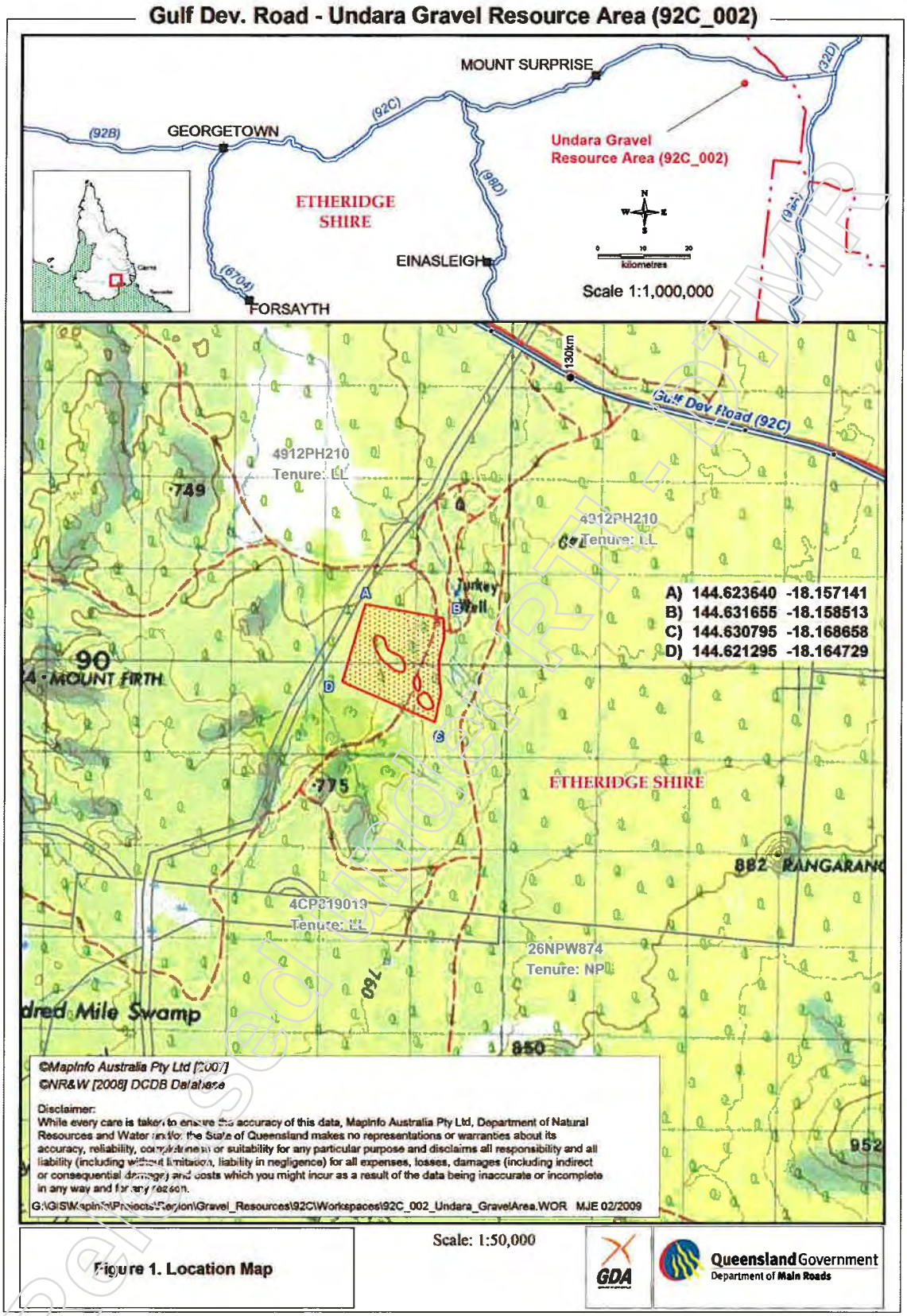


Figure 1. Location Map

Figure 1: Location of the Undara Resource Area.

Figure 2: Air-photo of the Undara Resource Area.

1.3 Scope

The report provides an ecological appraisal of the RA and its management needs, by undertaking the following:

- desktop assessment of relevant environmental databases;
- augment this desktop analysis with a rapid field assessment of geomorphic attributes;
- assess and verify RE mapping;
- assess the extent, floristic structure and composition of REs noting common and listed flora and weed species;
- search within the vegetation communities for plants of conservation significance under the *Nature Conservation Act* (NCA) and *Environmental Protection and Biodiversity Conservation Act* (EPBC) and, identify wildlife habitat including nesting sites;
- assess erosion potential through opportunistic observations and soil sampling;
- review legislation;
- identify opportunities and constraints; and
- develop strategies to manage the identified opportunities and constraints.

Cultural Heritage studies and Native Title assessments are not part of this assessment.

1.4 Previous studies

Lambert and Rehbein, on behalf of Main Roads, undertook an environmental assessment of the road reserve from the intersection of the Kennedy Developmental and Gulf Developmental Roads to Mount Surprise in early 2009, during the wet season. The consultant's study area was largely in basalt-derived soils and several kilometres to the north of the Undara RA. The most relevant results of the study included: the vegetation was generally consistent with that mapped by the Environmental Protection Agency; no rare & threatened flora or fauna were observed; Emerson Dispersion results indicated the soils demonstrate moderate dispersive properties (i.e. Emerson Dispersion Class 5 & 6); and, the basalt derived soils had moderate to good fertility.

1.5 Purpose of works, current condition of sites and extent of works

The Gulf Developmental Road is an important link and a significant transport route connecting the Georgetown / Gulf Savannah region to the north and far north coastal facilities at Townsville and Cairns.

The GDR has sections of substandard formation width, pavement and geometry. The Undara RA is accessed by way of the Undara access road, which is to the south off the GDR at chainage 130.63km. Construction materials from this RA will be used for upgrade of the GDR by way of shoulder widening, overlay and seal.

The RA is located on a leasehold tenure – 4912PH210LL. Several kilometres to the south of the RA, is the Undara Volcanic National Park. The site does not drain into or towards the National Park. The RA contains an extensive, occasionally used gravel pit (Figure 2 &, Photographs 1 & 2).

The disturbance envelope at the pit is approximately 6ha of which a substantial percentage is unrehabilitated. The extraction site has not been worked in accordance with the Main Roads Far North Region's Guideline – *Access, Investigation, Operation & Rehabilitation of Gravel Pits* (*Ver 0.2 March 2007*). Little topsoil remains adjacent to some workings. Accordingly, given the lack of topsoil, revegetation to an acceptable standard may be difficult to attain in the short term. However, although some areas have not been reshaped in accordance with the above-mentioned guideline, a number of ground cover and understorey species are colonising and stabilising the site (Photograph 3). Accordingly, it would be a retrograde step to disturb these areas.

Within the pit minor erosion is evident; it is largely limited to the confines of the batters. Sediment generated through erosion, is largely contained within the various extraction sites, due to the recessed shape of the floor. Erosion could be minimised by rehabilitating the existing workings and revegetating these areas. Overall, the liability, with regard to outstanding rehabilitation and erosion, is of a low to moderate concern.

Following field inspection and with the aid of topographic mapping, RA boundaries were delineated to ensure that works remain clear of identified watercourses (Figure 1) and minimise impacts on the National Park. In essence, the RA boundaries are in accordance with *Vegetation Management Act* guidelines with regard the distance of activities from watercourses and, minimise the potential for discharge of sediment into waterways.

It is anticipated that gravel extraction will entail some or all of the following, depending on the site utilised:

- test pit excavation;
- clearing and, stockpiling of timber, topsoil and overburden;
- excavation and stockpiling of construction materials;
- rehabilitation of the ground surface with appropriate drainage diversion works and revegetation.

In association with the above-mentioned Main Roads Far North Region's Guideline, gravel pit investigation, operation and rehabilitation shall be undertaken in accordance with conditions imposed under:

- NRW – Forest Products Quarry Licence;
- EPA - DA WT0566 (Itinerant Licence);
- Special Conditions (S. 1.8); and
- Standard Conditions (S. 1.9) contained within the REF.

Photograph 1- View of part of the existing pit within the Undara RA.

Photograph 2 - View of another section of the pit, within the Undara RA.

Photograph 3 - View of an old pit within the RA, that has revegetated naturally.

1.6 Gravel Pit Environmental Assessment Sheets, Vegetation Assessment Sheets and selected supporting desktop database searches.

Gravel Pit Environmental Assessment Sheet

LOCATION

Pit name / No.	Undara Resource Area			Road	Gulf Development Road
Pit existing or new	Existing	MAPINFO Pit No.	92C_002	Pit attribute data on MAPINFO	Y
Tenure and Lot/Plan	4912PH210LL				
Access Point (Chainage) and/or Geographic Reference	17.1km west of intersection of GDR & KDR				
Access Point (Lat/Long)	18.13748 144.65071				
Pit Boundaries (Lat/Long)	A) 144.623640 -18.157141□B) 144.631655 -18.158513□C) 144.630795 -18.168658□D) 144.621295 -18.164729				

BACKGROUND

Total pit area (ha)	88.94	Unrehabilitated Pit Area (ha)	3-4ha
Date of REF Author	Feb 2009 PDG	Adjacent landuse	Low intensity grazing
Describe the ground conditions	Wet, not burnt		
Is pit on or adjacent to a NP or other conservation area, if yes provide details	Yes, pit is ~2km west of Undara Volcanic National Park		
Are neighbours present adjacent to works area	No		

QG

ERA No# (eg, 19, 20, 22)	16
ERA Application / grant date	WT0566 - renewed May 08
If ERA held, provide number	Yes, WT0566

DEPT ISSUES

List protected species under NCA	Brachychiton ?chillagoensis
Is NCA permit required, if yes provide permit No. and No. of plants to be removed	No, the species is ouside the works area.
Will works cause a significant impact to listed species	No
Is Quarry Licence held, if yes provide No., if no provide applic'n d	Yes, QL11706
Is Quarry Licence required	Yes
Is extraction site on a mining lease, claim or MDL	No - Department of Mines and Energy search Mar 09
Is Water Act applicable	No and No
Is Water Act QMAN required	NA
Is Water Act QMAN held, if yes, provide no., if no, provide applic'n date	NA
Are works in a Declared Wild River Area; if yes, how will works impact WR legislation	No
Are VMA approvals required to clear freehold land, if yes provide details	No

SCIENCES

List declared weeds present	Rubber Vine (*Cryptostegia grandiflora)	Outline control if yes	Eradicate Rubber vine before works commence & ensur
Briefly, describe geology / soils	Pgz - Elizabeth Creek Granite; Mw46 soils		
List soil test results	Y - non sodic, low clay, low - mod dispersion risk		
Rate erosion risk (H, M, L)	Low - Mod	Are ASS an Issue? (< 5m AHD)	No
List RE No. and status (NOC, OC, E)	9.12.1, 9.12.3, 9.12.36 (all NOC)		
List canopy species	E. crebra, C. dallachiana, C. erythrophloia, E. chartabona, C. confertiflora		
Can works avoid 'OC / E' REs if not, list steps taken to mitigate damage	NA		
Will project cause significant impact to NES Matters, if yes describe	No		
Is site within a Wetland of National Significance	No, a temporal wetland is located to the north west		

General Comments

A number of scrapings over approx. 6ha are present; highly weathered to deco granite; REs are a reasonable match; visually soils display only minor erosion and overall erosion risks are low when worked in accordance with the rec's in the REF; adjacent to Undarra NP.

Recommended Site Management Commitments

Standard conditions apply; abide by MR Gravel Pit Guideline; no operations to occur within 50 m of 1st & 2nd order streams, 100m of 3rd & 4th order streams & 100m of any swamp; to ameliorate soils apply dolomite at 1kg/m2 incorporated 100mm deep into the soil profile; construct a dam for landholder as shown on Fig. 2; ensure all works are contained within the RAs; no works to occur on rocky knolls; rehab pits in view of Undara NP access road asap; eradicate Rubber vine & ensure all vehicles and equip have a current Vendor Declaration.

Undara Resource Area

Vegetation Assessment Sheet

Location:

The Undara Resource Area is located approximately 3km south west of the intersection of the Gulf Developmental Road and the access road to the Undara National Park. Access is by way of existing tracks off the Undara access road.

Vegetation Structure:

The RA is located within three regional ecosystems that are all open woodlands and classed as not of conservation significance.

Trees (T1) 10m – 14m:

RE 9.12.1 (10m – 14m): *Eucalyptus crebra* (D), *Corymbia dallachiana*, *Corymbia erythrophloia.*

RE 9.12.3 (14m – 18m): *Eucalyptus crebra* (D), *Eucalyptus chartaboma*, *Corymbia erythrophloia*, *Corymbia confertiflora*.

RE 9.12.36 (4m – 8m with emergent *Corymbia erythrophloia*): *Canarium australianum*, *Cochlospermum gillivraei*, *Brachychiton chillagoensis/albidus*.

Trees (T2):

Acacia farnesiana, Acacia leptostachya, Acacia leptoloba, Callitris intratropica, Corymbia dallachiana, Eucalyptus crebra, Eucalyptus chartaboma, Corymbia erythrophloia, Corymbia confertiflora, Homalium brachybotrys.

T3 & Understorey:

Eucalyptus crebra, Corymbia dallachiana, Eucalyptus chartaboma, Corymbia erythrophloia, Acacia bidwillii, Breynia sp., Bursaria incana, Capparis canescens, Erythrophleum chlorostachys, Ficus opposita, Grevillea glauca, Grevillea mimosoides, Larsenaikia octreata, Melia azedarach, Pavetta granitica, Persoonia falcata, Petalostigma banksii, Petalostigma pubescens, Planchonia careya, Psydrax saligna, Santalum lanceolatum, ?Terminalia aridicola, Terminalia platyptera, Trema tomentose, Xylomelum scottianum.

Groundcover:

Ageratum sp., Alloteropsis semialata, Aristida calycina, Aristida holathera, Aristida sp., Chamaecrista exigua, Cheilanthes sp., Commelina sp., Cymbopogon refractus, Crotalaria verrucosa, Cyperus sp., Dactyloctenium radulans, Dianella sp., Digitaria bicornis, Enneapogon sp., Eriachne ?mucronata, Eragrostis spp., Evolvulus alsinoides, Flemingia parviflora, Gomphrena sp., Grewia retusifolia, Heteropogon contortus, Heteropogon triticeus, Hybanthus enneaspermus, Indigofera linnaei, Indigofera linifolia, Indigofera hirsute, Ludwigia octovalvis,

Groundcover (cont.):

*Melhania oblongifolia/brachycarpa, Mitrasacme sp., Murdannia graminea, Panicum sp., Perotis rara, Praxalis sp., Polycarpaea corymbosa, Sarga plumosum, Sauropus sp., Setaria surgens, Sisus sp., Spemacoce ?brachystema, Spemacoce sp., Sida sp., Tephrosia juncea, Tephrosia spp., Themeda triandra, Trachymene bivestita, Trichodesma zeylanicum, Uraria lagopodioides, Wahlenbergia sp., , Zenostegia tridentate, Zornia muriculata, Zornia stirlingii, Zornia sp. *Bothriochloa pertusa, *Melinis repens, *Stylosanthes scabra, *Stylosanthes sp.*

Vines:

Cayratia trifolia, Cajanus marmoratus, Cajanus reticulatus, Cajanus sp., Ipomoea ?nil, Rhynchosia minima.

Weeds:

***Cryptostegia grandiflora, **Themeda quadrivalvis, **Tridax procumbens. .*

Integrity:

A significant portion of the RA has been used for gravel extraction over a number of years. Immediately adjacent to the existing pit and access tracks the resource area has scattered disjunct disturbances associated with gravel pit development. However the integrity, within a short distance, increases to moderately high with distance away from the disturbance envelopes, especially within the canopy and sub-canopy species. It is diminished, to some extent, by the presence of *Bothriochloa pertusa* (Indian Couch), which is well established as a pasture grass.

Plants of Conservation Significance:

The only listed plant of conservation significance, under the *Nature Conservation Act* (NCA) that may be present is *Brachychiton albidus*. This plant is similar to *Brachychiton chillagoensis* and it was difficult to distinguish between the two. However, the Brachychitons that are present are located on rocky knolls and these areas have been removed from the RA. Accordingly, there is no need to apply for a clearing permit under the NCA as the plant is not within an extraction area. The EPAs Wildlife On-line Extract highlighted the potential for *Ipomoea saintronanensis* (Attachment 3). *I. Saintronanensis* (Photographs 16 to 19) was not observed and if present, may be located in the vine-forests to the southwest of the RA. No listed plants under the EPBC were recorded.

Regional Ecosystem:

The RA has been mapped by the Environmental Protection Agency and for the most part, contains two mixed polygons (Figure 3 and Attachment 2). Ground-truthing supported the mapping. The RA is essentially located within REs 9.12.1 and 9.12.3 (Photographs 4 to 11) and, RE 9.12.36 (Photographs 12 to 15), which occurs to a lesser extent than the other two REs. None of the REs are of formal conservation significance. A description of the vegetation communities encountered is provided in the Vegetation Assessment Sheet (Section 1.6) and within Attachment 2.

Soils:

The CSIRO mapping indicates that the soils are from the "Mw46" soil unit. This unit has gently undulating to undulating topography with many low rocky rises that often have large granite tor outcrop: dominant soils are loamy or sandy red or yellow earths. Moderately deep loamy duplex soils occur on some lower slopes. Small areas of loamy grey earths may be present.

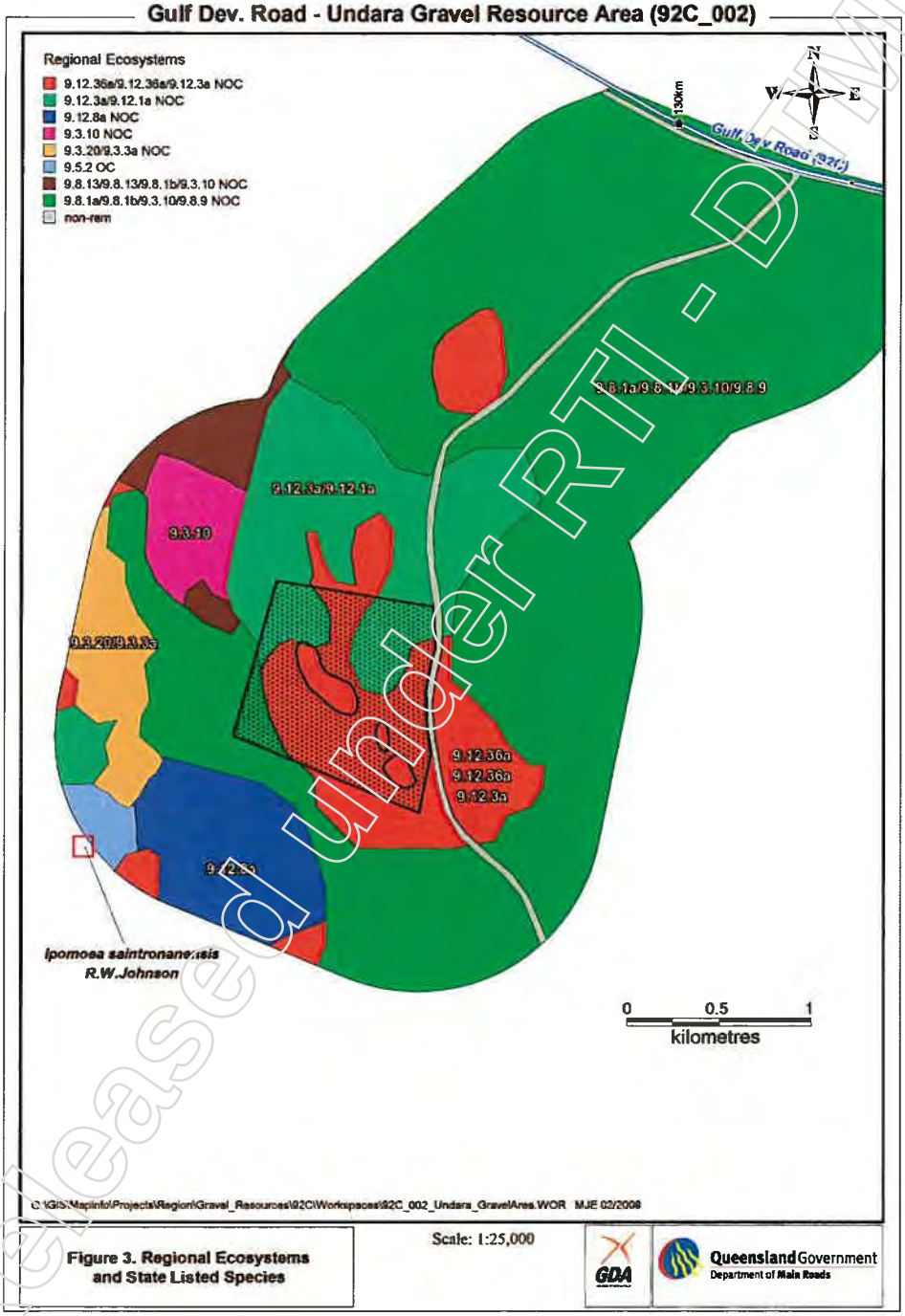


Figure 3. Regional Ecosystems and State Listed Species

Figure 3: Regional Ecosystem and HERBRECS data for Undara RA.

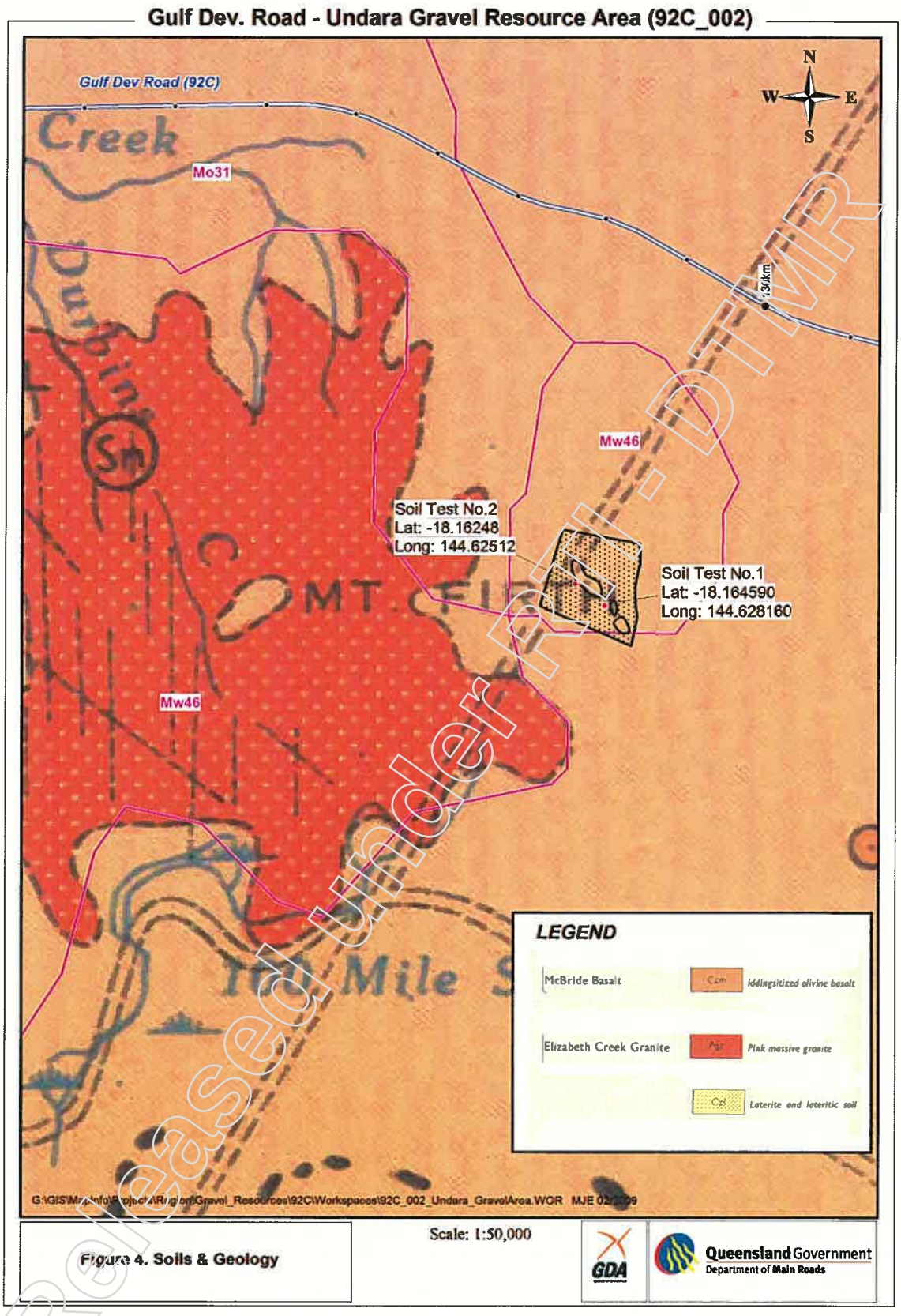


Figure 4. Soils & Geology

Figure 4: Geology and soils map.

Photograph 4 to 7 - Views of RE 9.12.1, looking to the north, east, south and west.

Photographs 8 to 11. View of RE 9.12.1.

Photographs 12 to 15 - Views of RE 9.12.36.

Photographs 16 to 19 - Views of *Ipomoea saintronanensis*.

1.7 Results

This assessment consisted of a desktop study with rapid field assessment. The REF identified:

- The RA is located on a leasehold tenure – 4912PH210LL. The gravel is vested with the State; accordingly, an approval under the *Forestry Act* is required prior to clearing and extracting gravel.

- Undara Volcanic National Park is located some 4km to the east and 2km to the south of the RA. This conservation area contains a volcanic crater and lava tubes, which are of considerable geological and biological significance. They are amongst the largest and best examples of their type in Australia. Furthermore, adjacent to the RA are vine forests (dry rainforests). These vegetation communities contain plants and animals of conservation significance that are listed on both State and Commonwealth databases.

- The RA is not within or adjacent to Wetlands of National Significance. A low drainage depression, which may be classed as a temporal wetland, is present approximately 1km to the north-north east of the RA. It is not expected that the works will have an impact on this wetland as the minor amount of sediment that is generated through erosion is largely contained within the pits. This is supported by the soil test results.

- Should the Special Conditions (S.1.8) and the Standard Conditions (S.1.9) be implemented and, with the exception of a permit from the Rural Fires Board and a Quarry Licence from NRW – Forest Products, no further approvals are required to undertake the gravel extraction.

- The disturbance envelopes within the RA comprise approximately 6ha of which approximately 50% is unrehabilitated. The extraction site has not been worked in accordance with the Main Roads Far North Region's Guideline – *Access, Investigation, Operation & Rehabilitation of Gravel Pits* (*Ver 0.2 March 2007*). Little topsoil remains adjacent to some workings. Accordingly, given the lack of topsoil, revegetation to an acceptable standard may be difficult to attain in the short term. That said, although some areas have not been reshaped in accordance with the above-mentioned guideline, a number of ground cover and understorey species are colonising and stabilising the site. Accordingly, it would be a retrograde step to disturb these areas. The rehabilitation liability is moderate.

- Two species of formal conservation significance listed under the *Nature Conservation Act* (NCA) potentially occur in the general area of the RA: *Ipomoea saintronanensis* and *Brachychiton chillagoensis*. *I. saintronanensis* was not recorded within the study area. However, if present, it may be located in the vine-forest to the southwest of the RA. The only listed plant of conservation significance, under the *Nature Conservation Act* (NCA) that may be present within the broader RA is *Brachychiton albidus*. This plant is similar to *Brachychiton chillagoensis* and it was difficult to distinguish between the two. However, the Brachychitons are located on rocky knolls (RE 9.12.36) which have been removed from the RA (Figures 1 and 2). Accordingly, there is no need to apply for a clearing

permit under the NCA as the plant is not within an extraction area. No listed plants under the EPBC were recorded.

- The RA, as mapped by the EPA, for the most part contains three mixed regional ecosystem polygons (Figure 3). Ground-truthing, to a large extent, supported the mapping. The RA is essentially located within REs 9.12.1 and 9.12.3 and to a lesser extent, RE 9.12.36. None of the REs are of formal conservation significance. A description of the vegetation communities encountered is provided in the Vegetation Assessment Sheet (Section 1.6) and within Attachment 2.

- A number of fauna species listed under the NCA and the EPBC have potential to occur within the study area. These species together with their status, habitat, probability of occurrence, potential impacts from the proposed works and, ameliorative measures and listed in the Fauna Table in Attachment 4. None of the species were observed during field work within the study area.

- Within the RA, Cryptostegia grandiflora (Rubber vine), *Themeda quadrivalvis* (Grader grass) *and Tridax procumbens* (Tridax) were observed. It should be noted that weeds such as *Calotropis procera* (Calotrope), *Ziziphus mauritiana* (Chinee apple), *Senna alata* (Candle bush), *Lantana camara* (Lantana), Acacia nilotica (Prickly acacia), *Acacia farnesiana,* and Parthenium hysterophorus (Parthenium) have been observed in the general area. Note that the Undara RA is outside the Parthenium Containment Zone. Thus, a high level of management ensuring that no infestations occur north of this area is mandatory. This level of management requires: pre-construction eradication to avoid seed production during works, a high degree of hygiene, ongoing monitoring for germination of plants, on-going spraying, limits on ground disturbance that provide bare soil for infestations, maintenance of ground cover preferably a high level of standing dry matter and, complying with the legislative requirement for transport of materials by weed transport declaration. Vendor Declarations shall be completed for all machinery and equipment working on-site. Essentially, weeds and hence hygiene, is an important issue on this project. Weed seed spread shall be minimised at every opportunity.

- The CSIRO mapping indicates that the soils are from the "Mw46" soil unit. This unit has gently undulating to undulating topography with many low rocky rises that often have large granite tor outcrop: dominant soils are loamy or, sandy red or yellow earths. Moderately deep loamy duplex soils occur on some lower slopes. Small areas of loamy grey earths may be present. Given the moderately shallow slopes adjacent to the pits and when worked in accordance with the above-mentioned operation and rehabilitation guideline, the risk of erosion is low.

- Soil sampling and analysis identified that soils have: low fertility; very slight to medium acidity, non-sodic; very low salinity; low clay and silt content; grey soils have a moderate tendency to disperse, while red soils have a low tendency to disperse. In summation they have a low to moderate risk of erosion. Furthermore, given the very shallow slopes adjacent to the pits and when worked in accordance with the above-mentioned operation and rehabilitation guideline the risk of erosion is low. Revegetation will further promote a

stable landform, protect exposed surfaces from erosion and minimise niches available for weed colonisation.

- To ameliorate the soils and assist revegetation dolomite as a first preference, or lime as a second preference, shall be added at 1kg/m^2 of disturbed ground. This additive shall be worked into the surface 100mm to 200mm deep.

Table 1. Abridged soil testing results.

Sample No.	pH	Elec. Cond dS/m	Ca /Mg Ratio	ESP %	Emerson No.	R1 Ratio	Clay %	Comments
1 - Red	6.5	0.02	6.8	0.8	5	0.52	19	Add dolomite at 1kg/m2 disturbed 100mm to 200mm deep
2 - Grey	5.7	0.01	0.4	1.7	2	0.86	7	Add dolomite at 1kg/m2 disturbed 100mm to 200mm deep

1.8 Special Conditions

1. Due to the close proximity of the Undara National Park, a conservation area containing geological and biological features renown Australia-wide, works shall not impinge on the visual amenity of the drive to the National Park. The operators shall rehabilitate all existing pits (pits in view of the Undara access road to be rehabilitated first). Furthermore, all extraction operations shall be conducted behind the hills to the west of the road.

2. Again, due to the close proximity of the Undara National Park, operators shall only to clear what is absolutely necessary and stringently abide by the Main Roads Peninsula Region's Guideline – *Access, Investigation, Operation & Rehabilitation of Gravel Pits* (*Ver 0.2 March 2007*).

3. In several areas of the existing workings, ground cover and understorey species are colonising and stabilising the site. It would be a retrograde step to disturb these areas. Operators shall not disturb these sites.

4. There is a shortage of water during the dry season. The landholder has requested that one of the old, unrehabilitated sections be excavated further and a dam constructed (as shown on Figure 2). There is potential for this site to become boggy and, become a trap for wildlife and stock. Accordingly, the ground should be track rolled and compacted to minimise potential for this occur and, to prevent the dam from leaking.

5. To ameliorate the soils and assist revegetation, dolomite as a first preference, or lime as a second preference, shall be added at 1kg/m^2 disturbed. The ameliorant shall be worked into the surface 100mm to 200mm deep.

6. A number of fauna species, of conservation significance, listed under both state and federal legislation occur within the RA. Ensure that the ameliorative measures to manage the potential impacts to these species (listed in Attachment 4) are implemented.

7. Two species of formal conservation significance potentially occur in the general area of the RA: *Ipomoea saintronanensis* and *Brachychiton chillagoensis.* Should *I. saintronanensis* be observed within the RA its presence should be recorded to the Main roads' environmental officers. Works shall not disturb this species. The other plant of conservation significance potentially present is *Brachychiton chillagoensis.* It is located on rocky knolls (RE 9.12.36) which have been removed from the RA (Figures 1 and 2). Accordingly, extraction shall not occur outside of the area shown on Figure 1.

8. Weeds and hence hygiene is an important issue on this project. Weed seed spread shall be minimised at every opportunity. Weed management requires: pre-construction eradication of all weeds listed within the REF with the exception of Grader grass and Tridax. Vendor Declarations shall be completed for all machinery and equipment working on-site.

9. No works shall occur outside the RA due to the proximity of the National Park; the presence of a temporal wetland; and the potential to disturb species of conservation significance.

1.9 Standard Conditions

The below-listed conditions are standard conditions for low to moderate risk RAs. If both the special and standard conditions are implemented and should extraction be undertaken during the dry season, the impact of the future works is likely to be low.

Location of REF

1. The Contractor and Inspector/Area Engineer shall have a copy of the REF onsite so that they are aware of and able to implement the various issues and/or conditions.

Public consultation

2. Undertake public consultation advising the adjacent landholders and traditional owners of Main Roads' activities.
3. Before Main Roads undertakes any works off the road reserve, permission (in writing) shall be obtained from the landholder.

Visual amenity

4. Operations to remain at least 75m from the road in an attempt to screen the pits from road users and to minimise weed seed spread.
5. All outstanding rehabilitation from previous extraction operations should be rehabilitated. This can be achieved cost-effectively if undertaken while earthmoving machinery is on-site and when seeding and fertilising of current operations occurs. It also honours our obligations to other government agencies and reinforces MR credentials as a good environmental corporate citizen.

Planning

6. An emergency plan should be developed to address fuel / chemical spills. Spill kits are to be readily available on site to contain and facilitate the clean up of any spills. Refueling should be conducted in a designated area, greater than 100m from any watercourse. All chemicals and fuels should be stored in a bunded area, as per AS1940.
7. Develop and implement an EMP and ESCP for the site, addressing the issues raised in this document.
8. Old test excavations are a safety hazard. Ensure that all old excavations are located, in-filled and revegetated.

Permits

9. Any burning off will require a permit from the Rural Fires Board.

10. The gravel is vested with the State. Accordingly, a Quarry Licence from NRW – Forest products is required. No Vegetation Management Act (VMA) approvals from NRW are required. Ensure that all works are in accordance with the QL approval conditions.
11. The resource areas all have pre-existing gravel pits and thus the DA for mobile and temporary works (Itinerant Licence number WT 0566) is valid. Ensure that works are undertaken in accordance with the conditions on the Main Roads DA for mobile and temporary works.
12. The road repair works are associated with wet season damage. However, the Certificate of Registration ENRE00536906 for ERA 20 Code of Environmental Compliance (post-wet season gravel extraction for road repairs in certain shires) is not valid. Hence this approval is not relevant.
13. Clearing for gravel pits shall not occur within:-
    - 200m of each high bank of each stream with a stream order of 5 and above.
    - 100m of each high bank of each stream with a stream order of 3 or 4.
    - 50m of each high bank of each stream with a stream order of 1 or 2.
    - 100m of any swamp or drainage depression shown on the attached maps or air-photos.
14. The Supers Rep/Project Manager shall ensure that all licences/permits are held before work commences.

Vegetation

15. Implement a minimum disturbance policy and visibly mark all boundaries to be cleared prior to disturbance commencing. Flagging shall remain until the works are completed.
16. No disturbance shall occur outside the resource area without appropriate approvals and further environmental assessments.

EPBC / Regional Ecosystems / Rare and threatened species

17. Activities covered under this REF are classed as not having a significant impact on Matters of National Environmental Significance. Thus referral under the EPBC is not required. No 'endangered' or 'of concern' regional ecosystems were observed within the study area. Minimise clearing to reduce the potential to impact species and regional ecosystems of conservation significance that may not have been identified.
18. The only plant of formal conservation significance identified was *Brachychiton chillagoensis.* No clearing permit from QPWS has been obtained for its removal. Ensure that works do not occur within the rocky knolls (RE 9.12.36), which have been removed from the RA (Figures 1 and 2). Accordingly, extraction shall not occur outside of the area shown on Figure 1.

Fauna

19. Wherever possible, large trees with hollows should not be removed as these trees provide nesting and roosting sites for birds, bats and mammals. Hollow bearing trees should be inspected for fauna before clearing and protected if found within the area to be cleared. The buffer should be at least equivalent to the diameter of the canopy to reduce the risk of root damage.

20. Minimise disturbance to rock outcrops and surrounding areas as they provide cool shelters, basking sites and protective crevices for animals and reptiles.

Water Quality

21. Plan construction works for the dry season to minimize the potential for discharge of sediment-laden water into adjacent watercourses.
22. No works are to occur within 100m of any stock watering dam. This is to minimize the potential for discharge of sediment-laden water into the dam.

Soils and Erosion

23. All soils pose an erosion risk. Work in accordance with Main Roads Peninsula Region's Guideline – *Access, Investigation, Operation & Rehabilitation of Gravel Pits* (*Ver 0.2 March 2007*) to minimise risks associated with erosion. Ensure that a sump is constructed when rehabilitating the pits (see special conditions).
24. Soil analysis identified that soils have: low fertility; very slight to medium acidity, non-sodic; very low salinity; low clay and silt content; grey soils have a moderate tendency to disperse, while red soils have a low tendency to disperse. In summation they have a low to moderate risk of erosion. To ameliorate the soils and assist in revegetation dolomite at 1kg/m^2 or as a second choice, agricultural lime at 1kg/m^2 should be added.
25. The stability of the works should be assessed the following year and any remedial works implemented.

Revegetation

26. Topsoil preservation is critical. Ensure that the top 150 mm of surficial material, which for want of a better word is called - 'topsoil', is retained and respread over the rehabilitated surface. Topsoil should not be stored in stockpiles greater than 1.5-2m high and nor should it be stored within 100m of waterways. Topsoil is to be respread before the application of seed, fertilizer and soil ameliorants. Topsoil should not be mixed with the subsoil. The stockpiles should be protected against loss of resource.
27. A slow/controlled release fertiliser should be added to boost nutrient levels. It is recommended that Nitro-phoska blue fertiliser is applied at 300kg/ha.
28. Japanese Millet, Green couch (Cynodon dactylon), Indian couch (*Bothriochloa pertusa*) and Verano stylo *(Stylosanthes hamata)* shall be spread over the disturbed area at a rate of 24kg/ha (6kg/ha of each species). With regard the Green couch 25% should be unhulled and 75% hulled.
29. Ensure that rehabilitation and revegetation of the above-mentioned areas occurs before the onset of the wet season.
30. A self imposed levee of \$1.50 / m^3 is generally sufficient to fund rehabilitation of gravel pits. In this instance, the imposition of \$2 / m^3 will allow extra funds to allow for the outstanding rehabilitation. Ensure that the volume excavated from pits is tallied and funds are set aside for rehabilitation in accordance with the above-mentioned guideline.

Weeds

31. A high priority should be given to the prevention of the spread of weeds to and from the site. General weed control and hygiene practices should be applied i.e.: vehicle wash-down before mobilisation to and from site, pre-construction eradication to avoid seed production during works; ongoing monitoring for germination of plants, on-going spraying, limits on ground disturbance that provide bare soil for infestations, maintenance of ground cover preferably a high level of standing dry matter and, complying with the legislative requirement for transport of materials by weed transport declaration. Vendor Declarations shall be completed for all machinery and equipment working on-site.

Cultural Heritage and Native Title

This section does not negate the requirement for further cultural heritage surveys, and only serves to provide preliminary advice.

32. Cultural Heritage constraints may be present. The CHANTLO shall advise of these requirements.
33. Should any evidence or suspected evidence of cultural heritage materials be found on the surface or subsurface during development/construction, operations shall cease and the Main Roads CHANTLO and Regional Cultural Heritage Manager for the EPA are to be notified immediately. Depending on the find, appropriate management measures may need to be implemented.
34. All Native Title issue must be addressed before commencement of works.

1.10 Preparation of REF

A Main Roads Environmental Officer prepared this REF. This document is for use at the sites listed above. It provides a record that the potential environmental impacts and measures required to address these impacts, have been considered.

The REF also considers whether it is appropriate to undertake a more comprehensive REF of the proposed works using a consultant. No further studies are required should the recommendations in the Special and Standard Conditions be implemented.

The Environmental Services Unit has approved this REF.

Paul Graham	March 2009
Senior Environmental Officer	Date

ATTACHMENTS

ATTACHMENT 1

EPBC Search Results and Assessment

Australian Government
Department of the Environment, Water, Heritage and the Arts

Environmental Reporting Tool

You are here: Environment Home > ERIN > ERT

23 February 2009 15:54

Database Report

This report includes places of national environmental significance that are registered in the Department of the Environment and Water Resources' databases, for the selected area. The information presented here has been provided by a range of groups across Australia, and the accuracy and resolution varies.

Search Type: Point

Buffer: 15 km

Coordinates: -18.157141,144.62364

Report Contents: Summary >> Details >> Caveat >> Acknowledgment

Biodiversity

Threatened Species:	8
Migratory Species:	13
Listed Marine Species:	13
Invasive Species:	12
Whales and Other Cetaceans:	None
Threatened Ecological Communities:	None

Heritage

World Heritage Properties:	None
Australian Heritage Sites:	1

Wetlands

Ramsar sites: (Internationally important)	None
Nationally Important Wetlands:	1

National Pollutant Inventory

Reporting Facilities:	None
Airsheds:	None
Catchments:	None

Protected Areas

Reserves and Conservation Areas:	1
Regional Forest Agreements:	None

Biodiversity

Threatened Species [Dataset Information]	Status	Comments
Birds		
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat	Endangered	Species or species habitat may occur within area
Pteropus conspicillatus Spectacled Flying-fox	Vulnerable	Species or species habitat may occur within area
Rhinolophus philippinensis (large form) Greater Large-eared Horseshoe Bat	Endangered	Species or species habitat may occur within area
Reptiles		
Egernia rugosa Yakka Skink	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Pristis microdon Freshwater Sawfish	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Comments
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Numenius minutus Little Curlew, Little Whimbrel	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat.	Migratory	Species or species habitat may

Painted Snipe		occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Listed Marine Species [Dataset Information]	Status	Comments
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
Numenius minutus Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile	Listed	Species or species habitat may occur within area

Invasive Species [Dataset Information]	Status	Comments
Selected Invasive Species: 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, 2001.		
Frogs		
Bufo marinus Cane Toad	Feral	Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat	Feral	Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit	Feral	Species or species habitat likely to occur within area
Sus scrofa Pig	Feral	Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox	Feral	Species or species habitat may occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia	WoNS	Species or species habitat may occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood	WoNS	Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda	WoNS	Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass	WoNS	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	WoNS	Species or species habitat may occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean	WoNS	Species or species habitat may occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed	WoNS	Species or species habitat likely to occur within area

Heritage

Australian Heritage Sites [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Undara Lava System QLD

Wetlands

Nationally Important Wetland Sites [Dataset Information]

Undara Lava Tubes, QLD

Other

Reserves and Conservation Areas [Dataset Information]

Undara Volcanic National Park, QLD

Caveat

The information presented here has been drawn from a range of sources, compiled for a variety of purposes. Details of the coverage of each dataset are included in the metadata [Dataset Information] links above.

Acknowledgment

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Place Details

Send Feedback

Undara Lava System, Gulf Developmental Rd, Mount Surprise, QLD, Australia

Photographs:

List:	Register of the National Estate
Class:	Natural
Legal Status:	Registered (21/10/1980)
Place ID:	9042
Place File No:	4/06/284/0007

Statement of Significance:

The Undara Crater and Lava Tubes place is of considerable geological and biological significance. The lava tubes at Undara are amongst the largest and best examples of their type in Australia. The place supports a diverse cave dwelling invertebrate fauna, many of which are endemic to the area or which are previously undescribed species. Speciation and evolution of these cave dwelling animals from their terrestrial counterparts is also in evidence within the lava tube ecosystems. Bayliss Cave contains at least fifty-two resident species of animals within the lava tube system and supports the most diverse assemblage of arthropods recorded for any cave in north Queensland. The caves at Undara also provide shelter and important breeding sites for at least four species of bats. These are the common bat (MINIOPTERUS SCHREIBERSII) and little bent wing bats (MINIOPTERUS AUSTRALIS), the little brown bat (EPTESCIUS PUMILIS) and the eastern horseshoe bat (RHINILOPHUS MEGAPHYLLUS). Inland north Queensland dry rainforests in general have strong affinities with the humid rainforests of the northern wet tropics and the eastern Australian coast. This suggests an evolutionary link between humid and arid (inland) communities. Many of the animals and plants of the dry rainforests are restricted or endemic to these communities and are not otherwise found outside of dry rainforest patches, while others have Gondwanan or wet tropical rainforest affinities. In addition, dry rainforests have provided refugia for animals and plants normally associated with wetter conditions, which would not otherwise persist in the more arid inland climate. Also, a high proportion of animals from surrounding woodland and forest habitats move into the dry rainforest on a seasonal basis. The dry rainforests of Undara are important for the maintenance of community level processes for both plant and animal associations. A number of butterfly species associated with rainforest habitats occur at the limit of their range in the Undara lava tubes. This is the most inland (western) record for the common aeroplane (PHAEDYMA SHEPHERDI) and the white blueline (NACADUBA KURAVA) and the most southerly record for the strychnine blue (VIRACHOLA DEMOCLES) butterflies. For the common Australian crow (EUPLOEA CORE) and other members of the milkweed butterfly sub-family (sf Danainae), the rainforest patches in the lava tube entrances provide significant habitats for aggregations of over wintering populations due to the sheltered, cooler and moister microclimates of these sites. Dry rainforest communities are uncommon and threatened at the national level. In addition, dry rainforest communities support rare and threatened species. For example, the nationally rare species IPOMOEA SAINTRONANENSIS (2RC), ATALAYA CALCICOLA (3R) and WRIGHTIA VERSICOLOR (3RC-), are present in the dry rainforests of the Undara Crater and Lava Flow. The Undara Crater and Lava Tubes are an important research site for the study of the formation of volcanic landforms including lava tubes and associated features, the understanding of regional volcanic events and the study of cave dwelling fauna and their ecology. The Wall lava flow is of

particular note as it is an uncommon landform on Earth and analogous to landforms found on the Moon. It has thus provided a means of understanding lunar terrain.

It is possible that cultural values, both indigenous and non-indigenous, of National Estate significance may exist in this place. As yet, these values have not been identified, documented or assessed.

Official Values: Not Available

Description:

The Undara Crater and Lava Tubes place contains interesting volcanic landforms and associated patches of dry rainforest. Undara Crater is an impressive, steep sided depression that is 340m across and 48m deep. The crater walls, rising 20m above the surrounding plains, are intact. Inside the crater, large blocks protrude from the walls and the floor is covered in red soil. The crater walls also show signs of former lava levels in the form of indistinct terraces. The best known features of the Undara lava flows are the caves or lava tubes. These are formed when a river of lava that is confined to a valley crusts over and develops a roof. Lava flows are then diverted underground, solidify against the walls, floor and roof of the existing structure and then drain out to form cylindrical tubes. Undara Crater and its associated lava flows are found within the McBride Volcanic Province some 200km south west of Cairns. The crater is the second youngest of the 160 vents found within the province and is thought to have erupted 190,000 years ago. Geological evidence points to a gentle outpouring of lava, which contrasts with the more explosive origins of other vents in the area. Lava flows from Undara Crater are estimated to cover 1,550km square and with a thickness of 5m to 20m, have a total volume of 23km cubed. Undara Crater is also the highest point of the McBride Volcanic Province at 120m above sea level. Lava flowed in all directions from the crater. The largest flows occurred to the west and north west and form a number of branches which flowed into and along ancestral streams of Cassidy Creek and Elizabeth Creek for 160km and the Lynd River for a further 90km. These flows formed the lava tubes and caves in evidence today. More than sixty-five caves are found within the Undara system. They are separated from each other by roof collapses or by a reduction of the tube as roofs and floors meet at the end of flows. Entrances to the caves form during the eruption of lava or by weathering and collapse. Over 6km of lava tubes are described from the area, with most of the caves in the Undara system being less than 200m in length. One notable exception is Bayliss Cave which at 1350m in length is considered the largest such feature in Australia. The lava tubes do not contain the intricate cave decorations of limestone systems. However, the roofs of some of the tubes are decorated with drip features known as lavicles. These features form when gases escaping from flowing lavas in a partially filled tube ignite, causing remelting of the roof. The walls of the lava tubes have horizontal ledges which mark lava level lines as flow diminished within the cave. Secondary linings are also seen on the walls which formed when subsequent flows coated the host or original lava. Remelted wall sections show drip and dribble structures which resemble cake icing. The floors of the caves are generally covered in silt, brought in by outside streams which flow during the summer wet season. Where the original floor is exposed, rope like structures, marginal gutters, crust fragments and pitting from roof remelting can be observed. The Wall is a feature located nearly 60km north west of Undara Crater. It forms a long narrow ridge, 70m-300m wide, 20m above the surrounding plain and 35km in length. The upper surface of the Wall is relatively flat, while the sides slope steeply. It formed when the toe of an elevated lava flow solidified at what is now the termination of the Wall. This caused temporary blockage of the lava flow and allowed the development of a roof, thereby creating a long lava tube. A surge of lava then broke down the toe and flow continued for a further 70km. No caves have been found along the Wall to date. The feature is however of great interest as it closely resembles structures found on the moon. Although heavily weathered, the lava flows of the Undara Crater have little soil cover and form rocky, undulating plains. Ironbark woodlands (EUCALYPTUS CREBRA) with grassy understoreys are found on these plains, with patches of vine thicket, a distinctive form of dry rainforest that occurs in areas with a high seasonality of rainfall. Vine thickets are characterised by a high diversity of tree species, many vines and a lack of herbaceous plants. The distribution of these dry rainforests is very patchy and is partially dependant on the exclusion of fire, thus dry rainforest occurrences are commonly associated with rocky outcrops. They may occur on basalt, granite, rhyolite, limestone, laterite, sandstone, as well as alluvium and heavy clay soils. Dry rainforests can also be found on very recent landforms such as beach ridges and recent basalt flows. The origins, evolution and dynamics of these communities are uncertain and subject to intense debate. There are over sixty small patches of dry rainforest at this site, many of which are less than one hectare in size. Most of these patches are associated with the shallow soils in collapse entrances of the lava

tubes, or with lava ponds, which are depressions of 50m to 100m across with elevated rims found to the north and west of Undara Crater. The dry rainforests of the Undara Crater and Lava Flow form an archipelago of patches extending across a basalt base. There are over sixty small patches of dry rainforest at this site, many of which are less than one hectare in size. The majority of these patches are associated with the shallow soils in collapse entrances of the lava tubes, or with lava ponds, which are found to the north and west of Undara Crater. The canopy of the dry rainforest patches reaches a height of between 5m to 8m. Commonly occurring canopy plants include native olive (NOTOLAEA MICROCARPA), ALECTRYON CONNATUS, scrub wilga (GEIJERA SALICIFOLIA), strychnine tree (STRYCHNOS AXILLARIS) helicopter tree (GYROCARPUS AMERICANUS) and white-flowered Bauhinia (LYSIPHYLLUM HOOKERI). Emergent trees rise above the canopy to a height of 6m to 15 m. Emergents include AUSTROMYRTUS BIDWILLII, broad leaved bottletree (BRACHYCHITON AUSTRALIS), Burdekin plum (PLEIOGYNIUM TIMORENSE) and ivory wood (SIPHONODON AUSTRALIS). Small trees and shrubs are locally abundant to rarely present. When present, this layer of the rainforest includes DIOSPYROS HUMILIS, currant bush (CARISSA OVATA), orange thorn (CITRIOBATUS SPINESCENS) and CLERODENDRUM FLORIBUNDUM ssp. ANGUSTIFOLIA. Grasses are generally absent from the understorey. Vines such as red passion flower (PASSIFLORA AURANTIA) monkey vine (PARSONSIA LANCEOLATA, P VELUTINA) and IPOMOEA SAINTRONANENSIS are common in the dry rainforest. A diverse moss flora (up to eleven species) is found in the understorey of many of the dry rainforest patches, particularly in the cave entrance examples, where moisture often collects. The entrances to the caves are typically inhabited by vine thicket species including figs (FICUS species) and bottle trees (BRACHYCHITON AUSTRALIS). Also recorded from these sites are a number of ferns, including ADIANTUM AETHIOPICUM, MICROSORIUM PUNGATUM and various species from the family Hymenophyllaceae. Some of these plants are undescribed and are likely to be endemic to the lava tubes. The vine thickets provide a habitat for a number of native bird species. Within the Undara place five birds are associated only with the vegetation of the lava flows, namely; red-winged parrot (APROSMICTUS ERYTHROPTERUS), blue winged kookaburra (DACELO LEACHII), dollarbird (EURYSTOMUS ORIENTALIS), little cuckoo shrike (CORACINA ROBUSTA) and little friar bird (PHILEMON CITREOGULARIS). A number of other animals are dependant on the dry rainforest, or seek shelter in the patches at certain times of the day or year. Included in this group are unadorned rock wallaby (PETROGALE INORNATA), common wallaroo (MACROPUS ROBUSTUS), antilopine wallaroo (MACROPUS ANTILOPINUS), short beaked echidna (TACHYGLOSSUS ACULEATUS), brush turkey (ALECTURA LATHANI), channel billed cuckoo (SCYTHROPS NOVAEHOLLANDIAE), Lewin's honeyeater (MELIPHAGA LEWWNII), varied triller (LALAGE LEUCOMELA), northern Banjo frog (LIMNODYNASTES TERRAEREGINAE), stonemason gungan (UPEROLEIA LITHOMODA), red speckled gugan (UPEROLEIA LITTLEJOHNI), the introduced cane toad (BUFO MARINUS), orchid butterfly (PAPILO AEGEUS), common albatross (APPIAS PAULINA), spotless grass yellow (EUREMA HECABE) and northern jezebel (DELIAS ARGENTHONA). Invertebrate communities in the dry rainforest are poorly known, however some butterfly surveys have been undertaken. Species typical of the dry rainforest are four bar swordtail (PROTOGRAPHIUM LEOSTHENES), five bar swordtail (GRAPHIUM ARISTEUS) and Australian crow (EUPLOEA CORE). The cave fauna of the Undara Lava Tubes are of great interest. To date, many hundreds of specimens have been collected from the area, with approximately thirty troglobitic (adapted to living permanently in the cave environment) invertebrate species identified so far. Bayliss Cave is home to at least twenty-four of these cave dwelling species. This includes six species of endemic spiders, four species of millipedes, centipedes, springtails, silverfish, cockroaches, beetles, assassin bugs and planthoppers. Some of the lava tubes also support highly specialised invertebrates adapted to foul air conditions with high carbon dioxide levels. Barkers Cave, which extends for over 560m is interesting because it terminates in a subterranean lake. The lake contains blind amphipods as well as frogs and tadpoles. The lake is considered a permanent water source although lake levels fluctuate widely from year to year. Divers have explored the lake to 50m from its surface. Vertebrate animals living in the lava tubes are poorly described. A number of species of bats, including the Common bent wing bat (MINIOPTERUS SCHREIBERSII), the little bent wing bat (MINIOPTERUS AUSTRALIS), the little brown bat (EPTESICUS PUMILIS) and the eastern horseshoe bat (RHINOLOPHUS MEGAPHYLLUS) are recorded in breeding colonies. The identification of the vine thickets at Undara Crater and Lava Tubes as an area of national estate significance resulted from site surveys of about 300 vine patches between Rockhampton and Chillagoe, conducted by the Queensland Department of Environment and Heritage with the assistance of Commonwealth funding. At this stage national estate places have been selected from

the northern most two thirds of the survey area. In addition to Undara Crater and Lava Tubes, a further seventeen vine thicket places have been identified as containing significant vine thicket values. Of the significant patches identified three others occur on basalt flows. These are Toomba Lava Flow and Big Bend, Kinrara Crater and Lava Flow and Valley of Lagoons.

History: Not Available

Condition and Integrity:

The Undara Lava Tubes are in excellent condition, with few disturbances in evidence. Grazing does occur in the surrounding area but has been concentrated away from the lava tubes. Furthermore, the rocky nature of the surface is a natural deterrent to cattle. Rubber Vine (CRYPTOSTEGIA GRANDIFLORA) occurs in low numbers on the lava flows, but generally the lava tubes and their immediate environs are free of exotic species. The dry rainforests of the Undara Crater and Lava Tubes are in excellent condition. There has been no clearing of these patches, there is no cattle or pig damage (although this has occurred in the surrounding plains), there is no lantana or rubber vine and herbaceous weeds rarely occur. The cane toad (BUFO MARINUS) is present in the dry rainforest. Minor fire damage has caused tree scorching in a few patches, but this is limited to patch edges only. The lava tubes are a tourist attraction, but impacts appear to be of a limited localised nature. The main resort is built some distance from the lava tubes and access to the caves by private vehicles is strictly controlled. Roads and car parks are found in the vicinity of some caves. Activities within the lava tubes which have caused some concern include the degradation of some cave floors through compaction with formerly unrestricted passage of cave visitors and disturbance to breeding colonies of bats. (1995)

Location:

About 7800ha, Gulf Developmental Road and Mount Surprise Road, 6km south-west of Mount Surprise, in three areas, comprising:
1) the Undara Crater, 300ha, defined as the area enclosed by a circle radius 1km centred at AMG point: 7861-St Ronans-610737;
2) the Undara Lava Tubes, 3500ha, defined as a strip of land 1km wide, extending 0.5km either side of a series of straight lines joining the following AMG points: 7861-610737, 600750, 594760, 590786, 540820, 510830, 460848, 427824, 400820, 370795, 7761-Mount Surprise -357816, 340802 and 320820;
3)the Lava Wall, 4,000ha, defined as a strip of land 1km wide extending 0.5km either side of a series of straight lines joining the following AMG points: 7761-150850, 133836, 114875, 095888, 093908, 080913, 067939, 067955, 057975, 028993, 980993, 966996, 924988, 905973, 878985 and 848988.

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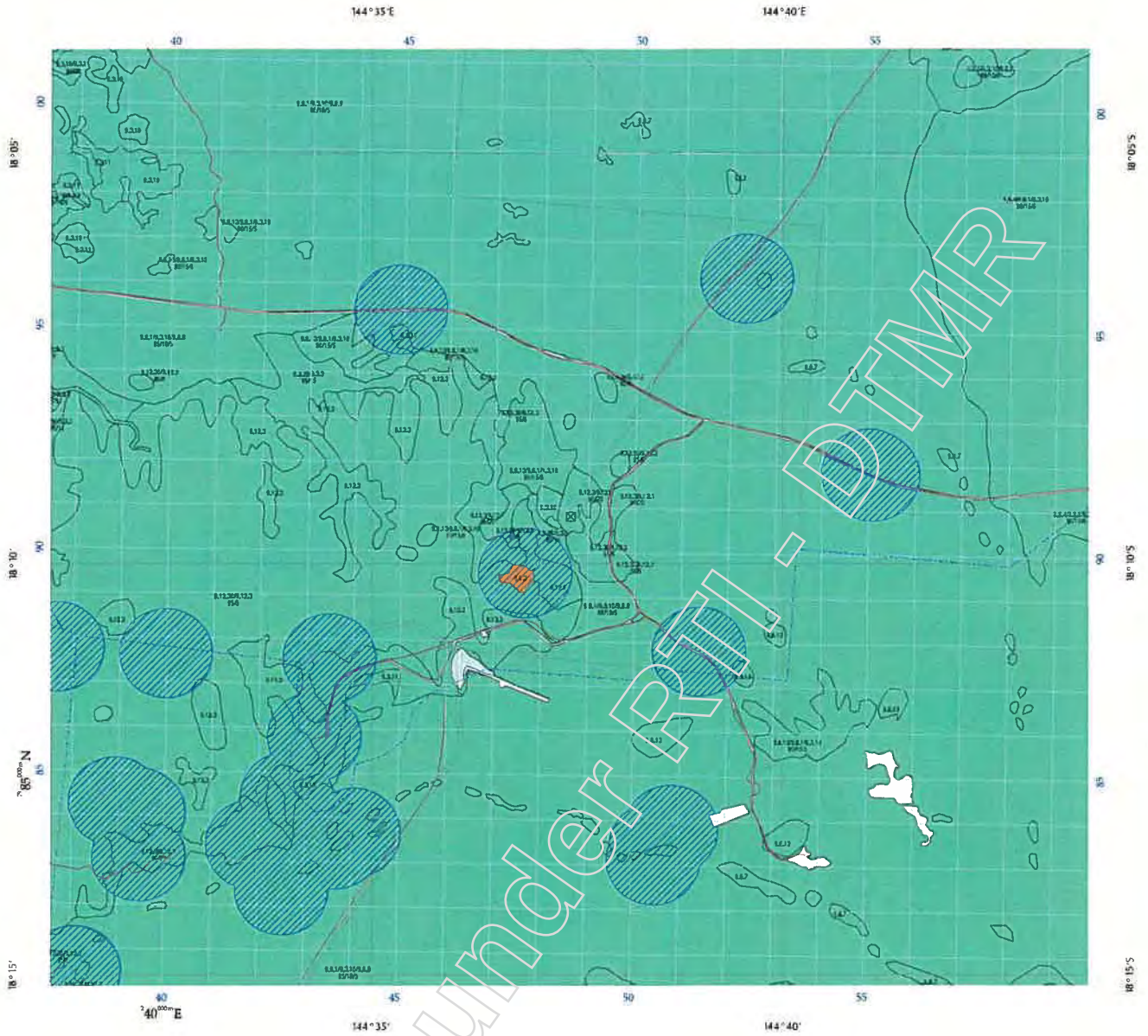
Report Produced: Mon Feb 23 16:09:12 2009

ATTACHMENT 2

Regional Ecosystem Map and Regional Ecosystem Descriptions



2003 REGIONAL ECOSYSTEM MAP

Based on 2003 Landsat TM imagery

Requested By: PAUL.D.GRAHAM@MAINROADS.QLD.GOV.AU
Date: 23 Feb 09 Time: 15.12.09

Centered on point position:
Latitude: -18.1571 Longitude: 144.6236 (decimal degrees)

This is a copy of the certified regional ecosystem map defined by the map extent for the purpose of the *Vegetation Management Act 1999*. Areas of property maps of assessable vegetation (PMAVs) are not shown on this map.

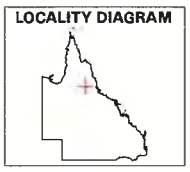
2003 Remnant endangered regional ecosystem
- Dominant
- Sub-dominant

2003 Remnant of concern regional ecosystem
- Dominant
- Sub-dominant

2003 Remnant not of concern regional ecosystem
Non-remnant
Plantation Forest
Dam or Reservoir
2003 Remnant Vegetation Cover (RVC)
Vegetation Management Act Essential Habitat
Area identified as essential habitat by the EPA for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*.
For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
Certified Map Amendment area
Roads
© MapInfo Australia Pty Ltd 2006
Bioregion boundary
National Park, Conservation Area State Forest and other reserves
Cadastre line
The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
Towns
Coordinate entered

Queensland Government

LOCALITY DIAGRAM



Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.epa.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

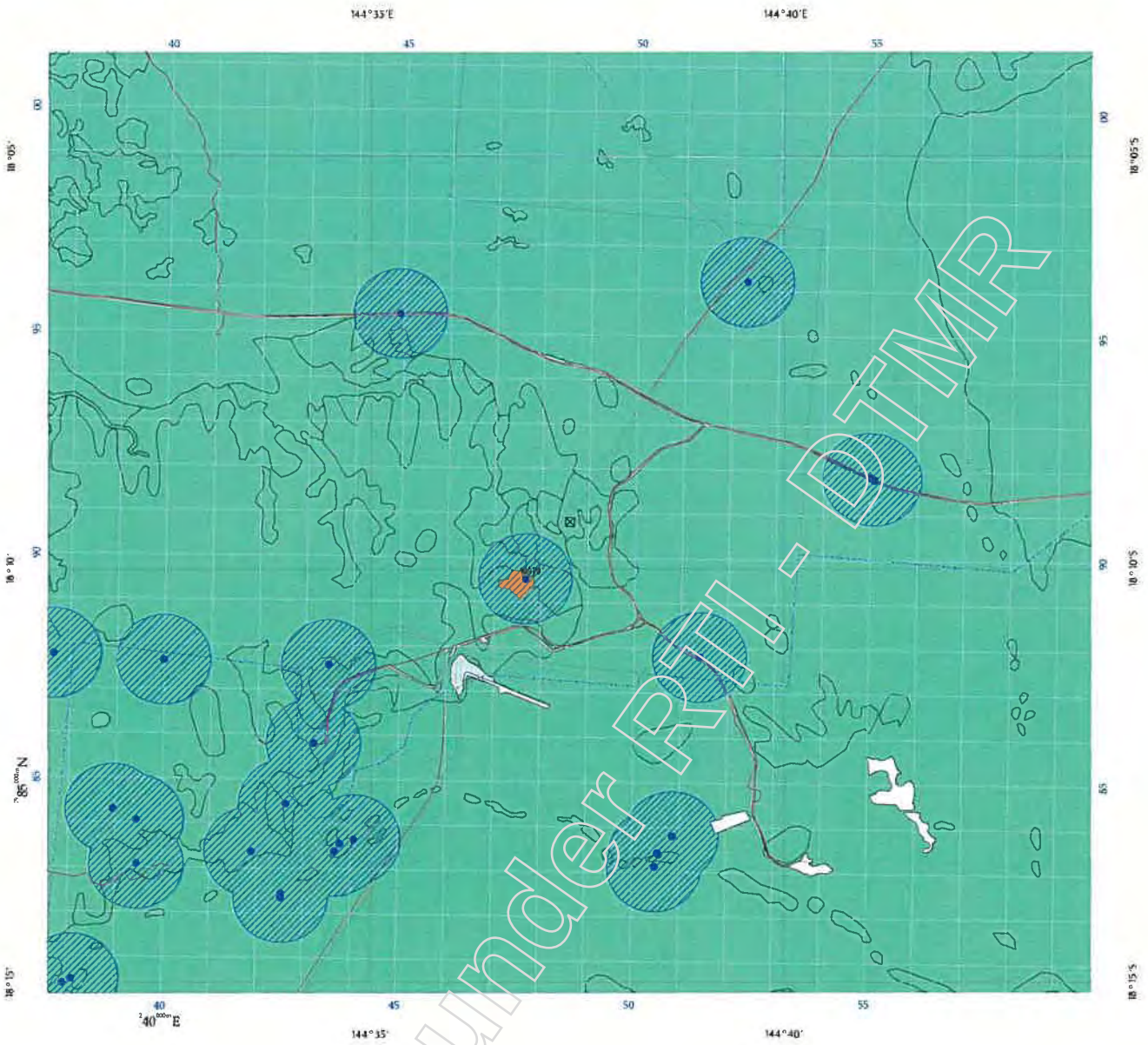
Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2003, depicted on this map is based on rectified 2003 Landsat TM imagery (supplied by SLATS, Department of Natural Reources and Water).

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Water, the Environmental Protection Agency and MapInfo Australia Pty Ltd, makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.nrw.qld.gov.au/vegetation or contact the Department of Natural Resources and Water.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.epa.qld.gov.au/REDATA or from the Queensland Herbarium for larger areas.
Email: regional.ecosystem@epa.qld.gov.au



VEGETATION MANAGEMENT ACT
ESSENTIAL HABITAT MAP

Requested By: PAUL.D.GRAHAM@MAINROADS.QLD.GOV.AU
Date: 23 Feb 09 Time: 15.12.12

Centered on point position:
Latitude: -18.1571 Longitude: 144.6236 (decimal degrees)

2003 Remnant endangered regional ecosystem
- Dominant
- Sub-dominant

2003 Remnant of concern regional ecosystem
- Dominant
- Sub-dominant

- 2003 Remnant not of concern regional ecosystem
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- 2003 Remnant Vegetation Cover (RVC)
- Vegetation Management Act Essential Habitat
  Area identified as essential habitat by the EPA for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*.
- Vegetation Management Act Essential Habitat Species Records
- Roads
  © MapInfo Australia Pty Ltd 2006
- Bioregion boundary
- National Park, Conservation Area State Forest and other reserves
- Cadastre line
  The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

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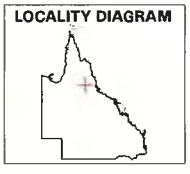
LOCALITY DIAGRAM



2000 0 2000 m

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Labels for Vegetation Management Act Essential Habitat are centred on the area of interest (1.1km surrounding and including a Lot on Plan or 2.2km around the selected coordinates). Labels relate to the attached species list.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2003, depicted on this map is based on rectified 2003 Landsat TM imagery (supplied by SLATS, Department of Natural Reources and Water).

Disclaimer:
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Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.epa.qld.gov.au/REDATA or from the Queensland Herbarium for larger areas.
Email: regional.ecosystem@epa.qld.gov.au

Vegetation Management Act Essential Habitat
Species Habitat Factors

Essential Habitat mapping for the following species is found within an area that includes :-
1.1km surrounding and including a Lot on Plan
or
2.2km around the selected coordinates.

Essential Habitat is compiled from a combination of species habitat models and buffered species records.
The NRW Essential Habitat page has more information on how the layer is applied under the VMA Codes.

Regional Ecosystems is a mandatory essential habitat factor, unless otherwise stated.
Essential Habitat must include a mandatory essential habitat factor as well as any two other factors.

Label	Scientific Name	Common Name	NCA Status	Regional Ecosystems (this is a mandatory essential habitat factor, unless otherwise stated)	Vegetation Community	Altitude	Soils	Position in Landscape
10979	Ipomoea saintronanensis		R	There are no essential habitat factors shown as this species has only been found in areas not subject to the VMA 1999 (eg State Forests and National Parks).	There are no essential habitat factors shown as this species has only been found in areas not subject to the VMA 1999 (eg State Forests and National Parks).	There are no essential habitat factors shown as this species has only been found in areas not subject to the VMA 1999 (eg State Forests and National Parks).	There are no essential habitat factors shown as this species has only been found in areas not subject to the VMA 1999 (eg State Forests and National Parks).	There are no essential habitat factors shown as this species has only been found in areas not subject to the VMA 1999 (eg State Forests and National Parks).

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Search Result: Regional Ecosystem 9.3.3

Regional Ecosystem ID Go!

Regional Ecosystem:	9.3.3
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	Of concern. High total grazing pressure and weeds such as Hyptis suaveolens are leading to degradation. Subject to minor clearing.
Subregion:	4, 2, 3, 1, 5, (6)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low
Wetland:	Floodplain (other than floodplain wetlands).

Short Description:
Mixed woodland dominated by Corymbia spp. and Eucalyptus spp. on alluvial flats, levees and plains

Structure Category:
Mid-dense

Description:
Mixed open forest to woodland including combinations of the species Eucalyptus leptophleba (Molloy red box), Corymbia tessellaris (Moreton Bay ash), C. dallachiana, C.clarksoniana (Clarkson's bloodwood), E.tereticornis (bluegum), E.brownii (Reid River box), E.crebra (sens. lat.)(narrow-leaved ironbark) or E.cullenii (Cullen's ironbark), E.persistens (box), E.platyphylla (poplar gum) and Erythrophleum chlorostachys (Cooktown ironwood). The shrub layer varies from absent to mid-dense Occurs on alluvial plains, terraces and levees. Soils are generally sandy alluvium Major vegetation communities include: 9.3.3a: Floodplain (other than floodplain wetlands). Eucalyptus leptophleba (Molloy red box) ± Corymbia dallachiana (Dallachy's gum) ± E.tereticornis (bluegum) ± E.brownii (Reid River box) ± E.crebra (sens. lat.)(narrow-leaved ironbark) or E.cullenii (Cullen's ironbark) ± E.persistens (box) ± E.platyphylla (poplar gum) woodland. The mid layer varies from absent to a mid-dense shrub layer of Melaleuca viridiflora (broad-leaved paperbark). The subdominant species may be co dominant in this community. 9.3.3b: Floodplain (other than floodplain wetlands). Mixed woodland including combinations of Corymbia tessellaris (Moreton Bay ash), C.dallachiana (Dallachy's gum), C.clarksoniana (Clarkson's bloodwood) with any mixture of Eucalyptus platyphylla (poplar gum), E.tereticornis (bluegum), E.camaldulensis (river redgum) and E. crebra (sens. lat.) (narrow-leaved ironbark) (or Eucalyptus cullenii (Cullen's ironbark) in the north) as subdominant species. There is no mid layer and the ground layer is sparse tussock grasses. 9.3.3c: Floodplain (other than floodplain wetlands). Eucalyptus leptophleba (Molloy red box) ± Corymbia clarksoniana (Clarkson's bloodwood) ± Erythrophleum chlorostachys (Cooktown ironwood) woodland. The mid layer is a variable very sparse to sparse shrub layer including E. chlorostachys, Planchonia careya (cocky

apple), Grewia retusifolia and C. confertiflora (broad-leaved carbeen). The ground layer is mid-dense to dense and is dominated by the grasses Heteropogon contortus (black speargrass) and H.triticeus (giant speargrass), Sarga plumosum var. plumosum (plume sorghum), Themeda triandra (kangaroo grass), Panicum sp. and Eragrostis sp. and forbs including Chamaecrista absus var. absus, Flemingia parviflora and Phyllanthus virgatus. 9.3.3d: Floodplain (other than floodplain wetlands). Mixed woodland including combinations of Eucalyptus leptophleba (Molloy red box), Corymbia tessellaris (Moreton Bay ash), C.dallachiana (Dallachy's gum) and C.clarksoniana (Clarkson's bloodwood) with any mixture of E.brownii (Reid River box), E.platyphylla (poplar gum), E.tereticornis (bluegum) , E.camaldulensis (river redgum) , E. crebra (narrow-leaved ironbark)(sens. lat.)(narrow-leaved ironbark) (or E.cullenii (Cullen's ironbark) in the north) as subdominants. The mid layer varies from absent to a sparse shrub layer including Melaleuca spp., Terminalia spp. and Planchonia careya (cocky apple). The sparse to mid-dense ground layer includes Themeda triandra (kangaroo grass) and Heteropogon contortus (black speargrass) and frequently has bare patches. 9.3.3e: Floodplain (other than floodplain wetlands). Eucalyptus leptophleba (Molloy red box) ± Corymbia polycarpa (long-fruited bloodwood) ± C.confertiflora (broad-leaved carbeen) ± E.platyphylla (poplar gum) woodland to open woodland. The mid layer varies from absent to regrowth of juveniles of canopy species. There is a grassy ground layer.

Supplementary Description:

Protected Areas:
Blackbraes NP, Blackbraes RR, Bulleringa NP, Dalrymple NP, Hann Tableland NP, Mount Lewis FR, Undara Volcanic NP

Comments:
This unit is distinguished from RE 9.3.2 by having Corymbia spp. and Eucalyptus spp. as a major component of the vegetation community. 9.3.3b: This unit is distinguished from 9.3.3d by not having E. leptophleba as a component of the community. 9.3.3d: This unit is distinguished from 9.3.3b by having E. leptophleba as a component of the community.

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Search Result: Regional Ecosystem 9.3.10

Regional Ecosystem ID [ ] Go!

Regional Ecosystem:	9.3.10
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	5, 4
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	High
Wetland:	Palustrine wetland (e.g. vegetated swamp).

Short Description:
Melaleuca bracteata ± Eucalyptus spp. emergents or vine thicket species open forest to dense shrubland on creeks and swamps in basalt plains

Structure Category:
Very sparse

Description:
Low closed forest to open woodland of Melaleuca bracteata (black teatree) ± Casuarina cunninghamiana (river sheoak) ± Eucalyptus leptophleba (Molloy red box) ± Eucalyptus spp. ± Corymbia spp. emergents or vine scrub species. The shrub layer varies from absent, to a continuum with M. bracteata and dry rainforest species where these are present. The ground layer is dominated by tussock grasses such as Heteropogon contortus (black speargrass), Eragrostis spp. and Eulalia aurea (silky browntop) or Cyperaceae spp.(sedges). This community is very variable in structure and can also occur as small clumps of trees in association with the grassland regional ecosystem 9.3.27 or as a dense subcanopy layer of M.bracteata under a dominant canopy of Casuarina cunninghamiana. Occurs on swamps and occasionally along creek lines on basalt geologies. Major vegetation communities include: 9.3.10a: Palustrine wetland (e.g. vegetated swamp). Melaleuca bracteata dominated shrublands & woodlands on or fringing swamps & springs on basalts 9.3.10b: Riverine wetland or fringing riverine wetland. Melaleuca bracteata dominated shrublands & woodlands on creeklines on basalt

Supplementary Description:

Protected Areas:
Blackbraes NP, Forty Mile Scrub NP, Great Basalt Wall NP, Kinrara NP, Mount Rosey RR, Porcupine Gorge NP, Undara Volcanic NP

Comments:
Subject to invasive weed species Cryptostegia grandiflora (rubbervine), Themeda quadrivalvis (grader grass), Acacia farnesiana (mimosa), Melinus repens (Red Natal grass), Passiflora foetida (stinking passionflower) and

Malvastrum americanum (spiked Malvastrum).These are groundwater discharge areas associated with salinity risk. Associated springs are subject to high total grazing pressure and can be considered endangered.

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Queensland Government

Environmental Protection Agency

Search Result: Regional Ecosystem 9.3.20

Regional Ecosystem ID Go!

Regional Ecosystem:	9.3.20
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	2, 1, 5, (4)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low

Short Description:
Eucalyptus microneura ± Corymbia spp. ± Melaleuca spp. woodland on alluvial plains

Structure Category:
Sparse

Description:
Woodland to low open woodland of Eucalyptus microneura (Georgetown box) ± Corymbia spp. ± E. leptophleba (Molloy red box) ± Terminalia spp. There is an absent to sparse mixed shrub layer which can include juvenile canopy species, Gardenia vilhelmii (breadfruit), Dolichondrone heterophylla (lemonwood), Atalaya hemiglauca (whitewood), Melaleuca spp. and Carissa lanceolata (currantbush) , with these species sometimes forming an open sub canopy layer. The grassy ground layer is generally dominated by Heteropogon contortus (black speargrass), Eragrostis spp. and Aristida spp. Occur on alluvial plains.

Supplementary Description:
Perry et al. (1964): Belmore Unit 3

Protected Areas:
Undara Volcanic NP

Comments:
Rubber vine Cryptostegia grandiflora infestation and total high grazing pressures are leading to degradation. Weeds species Hyptis suaveolens and Malvastrum americanum can also occur. This regional ecosystem can also can also have patches of grassland scattered through it.

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Queensland Government

Environmental Protection Agency

Search Result: Regional Ecosystem 9.8.1

Regional Ecosystem ID Go!

Regional Ecosystem:	9.8.1
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	5, (4)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Medium

Short Description:
Eucalyptus crebra (sens. lat.) or E. cullenii ± Corymbia erythrophloia ± E. leptophleba woodland on plains and rocky rises of basalt geologies

Structure Category:
Sparse

Description:
Open woodland to woodland of Eucalyptus crebra (narrow-leaved ironbark) ± Corymbia dallachiana (Dallachys gum) ± C.erythrophloia (red bloodwood). E.leptophleba (Molloy red box) sometimes occurs as a dominant. The midlayer is generally absent but an open subcanopy or shrub layer sometimes occurs. Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil. Major vegetation communities include: 9.8.1a: Open woodland to woodland of Eucalyptus crebra (narrow-leaved ironbark) ± Corymbia dallachiana (Dallachys gum) ± C.erythrophloia (red bloodwood) ± Corymbia spp. ± Eucalyptus spp. In some areas E.granitica (granite ironbark) may replace E.crebra. A sub-canopy can occur and include canopy species, Bursaria incana (prickly pine) and Petalostigma pubescens (quinine). The shrub layer ranges from absent to patches of shrubs including Maytenus cunninghamii (yellowberry bush), B. incana (prickly pine), Carissa lanceolata (currantbush), and Grevillea parallela (silver oak). The ground layer is dense and generally dominated by Heteropogon contortus (black speargrass), Themeda triandra (kangaroo grass) and H.triticeus (giant speargrass). Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil. 9.8.1b: Open woodland to woodland of Eucalyptus leptophleba (Molloy red box) ± C. erythrophloia (red bloodwood) ± Corymbia dallachiana (Dallachys gum) ± C. confertiflora (broad-leaved carbeen) ± C. clarksoniana (Clarkson's bloodwood) ± E.platyphylla (poplar gum). There is generally no shrub layer but scattered species including Planchonia careya (cocky apple), Maytenus cunninghamii (yellowberry bush) and Carissa lanceolata (currantbush) can occur. The ground layer is dense and grassy and can include Heteropogon contortus (black speargrass) and/or Themeda spp. Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil.

Supplementary Description:

Protected Areas:
Blackbraes NP, Blackbraes RR, Dalrymple NP, Forty Mile Scrub NP, Girringun NP, Great Basalt Wall NP, Kennedy Road Gravel RR, Kinrara NP, Moonstone Hill RR, Mount Rosey RR, Porcupine Gorge NP, Undara Volcanic NP, White Mountains NP

Comments:
Vulnerable to invasive weeds species Cryptostegia grandiflora (rubbervine) , Lantana camara, Melinus repens (Red Natal gass) and Acacia farnesiana (mimosa). Logging of C. citriodora on Chudleigh Plateau. Very widespread in the bioregion. Includes some areas that may have E. xanthoclada or E. drepanophylla as the dominant Eucalyptus species. This eocsystem is the ironbark woodland of lower rainfall areas on basalt and is distinguished from RE 9.8.4 (ironbark woodland of wetter areas of basalt) by different sub-dominant species. 9.8.1a: In the northern end of this community E. crebra (sens. lat.) may overlap with E. cullenii. 9.8.1b: The regional ecosystem 9.8.2a differs from this community by being confined to the basalts around Mareeba and Lakeland Downs.

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Search Result: Regional Ecosystem 9.8.9

Regional Ecosystem ID Go!

Regional Ecosystem:	9.8.9
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	5, (6)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low

Short Description:
Eucalyptus orgadophila ± Corymbia spp. open woodland to woodland on basalt plains and rocky basalt hills

Structure Category:
Very sparse

Description:
Open woodland to woodland of Eucalyptus orgadophila (mountain coolibah) ± Corymbia dallachiana (Dallachy's gum) ± E.crebra (sens.lat.) (narrow-leaved ironbark) ± C.erythrophloia (red bloodwood) with occasional small patches of grassland. There is generally no mid layer although scattered juveniles of the canopy species may occur or in the wetter areas clumps of Melaleuca bracteata (black teatree) can occur. The ground layer is dense and grassy and dominated by Heteropogon contortus (black speargrass) and/or Themeda triandra (kangaroo grass). Occurs on basalt plains to gently undulating plains. Some areas may have basalt boulders to the surface. Soils are generally brown-black vertosols and brown ferrosols.

Supplementary Description:

Protected Areas:
Blackbraes NP, Girringun NP, Great Basalt Wall NP, Kinrara NP, Mount Rosey RR, Porcupine Gorge NP, Undara Volcanic NP

Comments:
Vulnerable to invasion by the woody weed Acacia farnesiana (mimosa) and the pasture species Cenchrus ciliaris (buffel grass).

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Queensland Government

Environmental Protection Agency

Search Result: Regional Ecosystem 9.12.1

Regional Ecosystem ID Go!

Regional Ecosystem:	9.12.1
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present. Vegetation communities within this regional ecosystem have rare and threatened species present and are degraded by grazing pressure, and environmental weeds.
Subregion:	4, (2), (6)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low

Short Description:
Eucalyptus crebra (sens. lat.) ± Corymbia erythrophloia ± C. dallachiana woodland on intermediate volcanic rocks

Structure Category:
Very sparse

Description:
Low open woodland to woodland of Eucalyptus crebra (narrow-leaved ironbark) and/or E.xanthoclada (yellow-branched ironbark) and/or E.drepanophylla (grey ironbark) and/or E. paedoglauca (Mount Stewart ironbark). The mid layer is usually absent but an open sub-canopy or shrub layer can occur. Sparsely wooded areas may grade into grassland. Occurs on a variety of landforms from undulating plains to steep hills on granodiorites Major vegetation communities include: 9.12.1a: Low open woodland to woodland of Eucalyptus crebra (narrow-leaved ironbark) ± Corymbia dallachiana (Dallachy's gum) ± C.erythrophloia (red bloodwood) ± C.clarksoniana (Clarkson's bloodwood) ± Corymbia spp. E.exilipes (fine-leaved ironbark) can sometimes occur as a dominant. An open sub-canopy can occur with mixed species including Geijera salicifolia (wilga), Petalostigma pubescens (quinine), Maytenus cunninghamii (yellowberry bush), Bursaria incana (prickly pine), Acacia spp. as well as juvenile canopy species. An open shrub layer can occur and include canopy and sub-canopy species or Carrisa lanceolata (currantbush). The sparse to dense ground layer is dominated by Heteropogon contortus (black speargrass) and Themeda triandra (kangaroo grass). Small areas in the south of the bioregion that can be dominated by Corymbia terminalis (western bloodwood). C.erythrophloia or C.leichhardtii (yellowjacket) may be included in this vegetation community. Occurs on a variety of landforms from undulating plains to steep hills on granodiorites 9.12.1b: Open woodland to low open woodland of Eucalyptus xanthoclada (yellow-branched ironbark) ± Corymbia erythrophloia (red bloodwood) ± Corymbia spp. ± Eucalyptus spp. There may be a sparse sub-canopy layer which can include Acacia bidwillii (corkwood wattle), Bursaria incana (prickly pine) or

Euroschinus spp. The shrub layer is generally dense and can contain mixed species including Maytenus cunninghamii (yellowberry bush), B.incana, Carissa lanceolata (currantbush), A.bidwilli and Persoonia falcata. The ground layer is sparse tussock grasses dominated by Heteropogon contortus (black speargrass). Occurs on a variety of landforms from undulating plains to steep hills on granodiorites 9.12.1c: Woodland of Eucalyptus drepanophylla (grey ironbark) or E.crebra (narrow-leaved ironbark) ± Corymbia erythrophloia (red bloodwood) ± C.dallachiana (Dallachy's gum). An open subcanopy or shrub layer containing canopy species ± Acacia bidwillii (corkwood wattle) ± Bursaria incana (prickly pine) often occurs. The grassy ground is dominated by Themeda triandra (kangaroo grass) and Heteropogon contortus (black speargrass). Occurs on a variety of landforms from undulating plains to steep hills on granodiorites 9.12.1d: Woodland of Eucalyptus crebra (narrow-leaved ironbark) or E.granitica (granite ironbark) ± C.dallachiana (Dallachy's gum) ± Corymbia spp. The mid layer ranges from absent to sparse and can include Acacia flavescens (yellow wattle), Grevillea glauca (bushmans clothepeg), Bursaria incana (prickly pine) and juvenile canopy species. The dense grassy ground layer is dominated by Heteropogon contortus (black speargrass) and Themeda triandra (kangaroo grass). Occurs on steep rugges hills and mountain ranges 9.12.1e: Grassland with isolated trees of Eucalyptus crebra (sens. lat.)(narrow-leaved ironbark) ± clumps of shrubs of Acacia decora and/or A.leptostachya (slender wattle) and/or Jacksonia thesioides and/or Allocasuarina inophloia (stringybark sheoak). Grassland. 9.12.1f: Woodland of Eucalyptus paedoglauca (Mount Stewart ironbark) ± Corymbia erythrophloia (red bloodwood) ± C.dallachiana (Dallachy's gum). Midlayer absent to sparse. Grassy cover dominated by Heteropogon contortus (black speargrass) and Themeda triandra (kangaroo grass). Occurs on granite hills.

Supplementary Description:
Perry et al. (1964): Leichhardt Unit 1 and Unit 2

Protected Areas:
Forty Mile Scrub NP, Girringun NP, Undara Volcanic NP, White Blow CP

Comments:
Vulnerable to invasion by the weeds Cryptostegia grandiflora (rubbervine), Acacia farnesiana (mimosa), Melinus repens (Red Natal grass) , Zyziphus mauritianum (chinee apple) and the exotic pasture species Cenchrus ciliaris (buffel grass). In wetter areas Lantana camara can be invasive. This regional ecosystem is distinguished from 9.12.11 which occurs on acid volcanics. 9.12.1d: The structure of this vegetation community is consistently taller and more dense than other vegetation communities in 9.12.1

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Search Result: Regional Ecosystem 9.12.3

Regional Ecosystem ID Go!

Regional Ecosystem:	9.12.3
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	2, 5, 3
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low

Short Description:
Eucalyptus chartaboma ± Eucalyptus spp. ± Corymbia spp. woodland on sandy soils on acid volcanics

Structure Category:
Sparse

Description:
Eucalyptus chartaboma (Queensland flaky-bark) and E. crebra (sens. lat.) (narrow-leaved ironbark) or E. cullenii (Cullen's ironbark) ± Corymbia erythrophloia (red bloodwood) ± E.tetrodonta (Darwin stringybark) ± C.dallachiana (Dallachy's gum) ± C.clarksoniana (Clarkson's bloodwood) woodland. The mid layer varies from absent to an open shrub layer including juveniles of canopy species, Petalostigma banksii (smooth-leaved quinine), Terminalia aridicola (arid peach), Erythrophleum chlorostachys (Cooktown ironwood), Acacia spp., Jacksonia spp., Grevillea spp., Bossiaea armitii and Xylomelum scottianum. The sparse ground layer is grassy. In the north of the bioregion the Eucalyptus crebra is replaced by E. cullenii. Small areas with C.trachyphloia (brown bloodwood) or E.similis (yellowjacket) may occur. Occurs in patches on footslopes, low hills, crests and ridges. Major vegetation communities include: 9.12.3a: Eucalyptus chartaboma (Queensland flaky-bark) and E.crebra (sens. lat.)(narrow-leaved ironbark) or E.cullenii (Cullen's ironbark) ± Corymbia erythrophloia (red bloodwood) ± E. tetrodonta (Darwin stringybark) ± C.dallachiana (Dallachy's gum) ± C.clarksoniana (Clarkson's bloodwood) woodland. The mid layer varies from absent to an open shrub layer including juveniles of canopy species, Petalostigma banksii (smooth-leaved quinine) , Terminalia aridicola (arid peach) , Erythrophleum chlorostachys (Cooktown ironwood) , Acacia spp., Jacksonia spp. and Grevillea spp.. The sparse ground layer is grassy. 9.12.3b: Eucalyptus chartaboma (Queensland flaky-bark), Corymbia pocillum, C.trachyphloia (brown bloodwood) and E. crebra (sens. lat.)(narrow-leaved ironbark) ± E.similis (yellowjacket) woodland. The mid-dense mid layer is shrubs including Acacia julifera (catkin wattle), Gastrolobium grandiflorum, Bossiaea armitii, Xylomelum scottianum and Grevillea spp.. The sparse ground layer is grassy.

Supplementary Description:

Protected Areas:
Undara Volcanic NP

Comments:
Occurs in patches

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Queensland Government

Environmental Protection Agency

Search Result: Regional Ecosystem 9.12.8

Regional Ecosystem ID Go!

Regional Ecosystem:	9.12.8
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	2, 4, 6, 3, (5)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	High

Short Description:
Semi-evergreen vine thicket on rocky outcrops and shallow soils of acid volcanic rocks

Structure Category:
Dense

Description:
Semi-evergreen vine thicket of species including Cochlospermum gillivraei, Canarium australianum, Ficus spp., Brachychiton spp., Strychnos lucida, Cupaniopsis anacardioides, Acacia spp., Schefflera actinophylla, Gyrocarpus americanus, Pouteria spp., Carissa lanceolata, Erythroxylum australe and Larsenaikia ochreata. Areas of Eucalyptus crebra (sens. lat.) emergents may occur. Occurs on hills and steep slopes with skeletal soils and frequent surface boulders. Major vegetation communities include: 9.12.8a: Semi-evergreen vine thicket of species including Cochlospermum gillivraei (kapok), Canarium australianum, Ficus spp., Brachychiton spp., Strychnos lucida (strychnine bush), Cupaniopsis anacardioides, Acacia spp., Schefflera actinophylla (umbrella tree), Gyrocarpus americanus (helicopter tree), Pouteria spp., Carissa lanceolata (currantbush), Erythroxylum australe (cocaine tree) and Larsenaikia ochreata. Areas of Eucalyptus crebra (sens. lat.)(narrow-leaved ironbark) emergents may occur. 9.12.8b: Scattered semi-evergreen vine thicket species on granite boulders and rock pavements. Occurs on granite boulders and rock pavements.

Supplementary Description:
Godwin and Jago (1998): Ca6;

Protected Areas:
Chillagoe-Mungana Caves NP, Girringun NP

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Queensland Government

Environmental Protection Agency

Search Result: Regional Ecosystem 9.12.36

Regional Ecosystem ID Go!

Regional Ecosystem:	9.12.36
Vegetation Management Act status (December 2005):	Not of concern
Biodiversity Status:	No concern at present
Subregion:	2, 5, (1)
Estimated Extent:	In September 2003, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained.
Extent in Reserves:	Low

Short Description:
Deciduous low woodland and/or Acacia leptostachya shrubland on rocky outcrops

Structure Category:
Sparse

Description:
Low woodland to low open woodland of Cochlospermum gregorii or C. gillivraei (kapok) ± Terminalia spp. ± Erythrophleum chlorostachys (Cooktown ironwood) ± Corymbia erythrophloia (red bloodwood) ± Brachychiton chillagoensis (kurrajong) or low woodland to woodland of Acacia leptostachya (slender wattle) and/or Petalostigma banksii (smooth-leaved quinine) ± Eucalyptus microneura (Georgetown box) ± Cochlospermum spp. The subdominants vary in composition and can include deciduous vine thickets species. A sparse shrub layer can include P.banksii, Acacia spp. and Grevillea spp. The ground layer is often dominated by Arsitida spp., Schizachyrium spp.(firerass) and Heteropogon contortus (black speargrass). Occurs on rocky outcrops and tops of hills with granite boulders to the surface. Major vegetation communities include: 9.12.36a: Low woodland to low open woodland of Cochlospermum gregorii or C. gillivraei (kapok) ± Terminalia spp ± Erythrophleum chlorostachys (Cooktown ironwood) ± Corymbia erythrophloia (red bloodwood) ± Brachychiton spp. The subdominants can include vine thicket species such as Ficus opposita (sandpaper fig), Drypetes deplanchei(yellow tulipwood), Pouteria sericea(wongay) and Homalium brachybotrys. A sparse to open mixed shrub layer can include Persoonia falcata, Petalostigma banksii (smooth-leaved quinine), Grevillea mimosoides and Acacia spp. The ground layer is often dominated by Aristida spp., Schizachyrium spp. (firegrass) and Heteropogon contortus (black speargrass). Occurs on rocky outcrops and tops of hills with granite boulders to the surface. 9.12.36b: Low open woodland to low woodland of Acacia leptostachya (slender wattle) ± Eucalyptus microneura (Georgetown box) ± Cochlospermum gregorii or C.gillivraei (kapok) ± Corymbia erythrophloia (red bloodwood) or C.pocillum ± Erythrophleum chlorostachys (Cooktown ironwood). Eucalypus microneura often occurs as an emergent. The shrub layer is of scattered plants and can include Grevillea spp., Acacia spp.and Petalostigma banksii (smooth-leaved quinine). The sparse to dense grassy ground layer is

dominated by Aristida spp. and Shizachirium fragile (firegrass). Occurs on steep rocky granite hills. 9.12.36c: Shrubland of Acacia leptostachya (slender wattle) and/or Petalostigma banksii (smooth-leaved quinine) ± Corymbia erythrophloia (red bloodwood). Erythrophleum chlorostachys (Cooktown ironwood) and/or Corymbia erythrophloia may occur as emergents. Scattered P.banksii can occur in the shrub layer. The sparse ground layer is grassy and dominated by Aristida spp. and Heteropogon contortus (black speargrass). Occurs on granite hills.

Supplementary Description:
Perry et al. (1964): Leichhardt Unit 1; Perry et al. (1964): Georgetown Unit 1; Perry et al. (1964): Belmore Unit 1 and Unit 2

Protected Areas:
Bulleringa NP, Forty Mile Scrub NP, Undara Volcanic NP

Comments:
This regional ecosystem occurs within RE 9.12.1, RE 9.12.6 and RE 9.12.15. 9.12.36a: Vunerable to the invasion of exotic weed Senna magnifolia (weedy Cassia). 9.12.36b: In the northern part of the Newcastle Range, this community can occur as a woodland of the subdominants with A. leptostachya as a mid layer.

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ATTACHMENT 3

Environmental Protection Agency – Wildlife Online Extract

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: 18.157141
Longitude: 144.62364
Distance: 15
Email: paul.d.graham@mainroads.qld.gov.au
Date submitted: Monday 23 Feb 2009 15:53:32
Date extracted: Monday 23 Feb 2009 16:08:03

The number of records retrieved = 740

Disclaimer

As the EPA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			26
animals	amphibians	Hylidae	*Cyclorana sp.*					2
animals	amphibians	Hylidae	*Litoria nasuta*	striped rocketfrog		C		7
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		4
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		24
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		25
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		19
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		14
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		30/1
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		6
animals	amphibians	Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		C		15
animals	amphibians	Limnodynastidae	*Limnodynastes terraereginae*	scarlet sided pobblebonk		C		6/1
animals	amphibians	Myobatrachidae	*Crinia deserticola*	chirping froglet		C		4/2
animals	amphibians	Myobatrachidae	*Uperoleia lithomoda*	stonemason gungan		C		16
animals	amphibians	Myobatrachidae	*Uperoleia littlejohni*	Einasleigh gungan		C		11
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		1
animals	birds	Acanthizidae	*Gerygone albogularis*	white-throated gerygone		C		9
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		10
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		8
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		2
animals	birds	Accipitridae	*Hieraaetus morphnoides*	little eagle		C		1
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		3
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza		C		1
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		3
animals	birds	Accipitridae	*Hamirostra melanosternon*	black-breasted buzzard		C		1
animals	birds	Accipitridae	*Accipiter novaehollandiae*	grey goshawk		R		1
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		2
animals	birds	Anatidae	*Aythya australis*	hardhead		C		1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		6
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		C		5
animals	birds	Ardeidae	*Ardea modesta*	eastern great egret		C		1
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		3
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		4
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		1
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		1
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		33
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		16
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		28
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		3
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		2
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		4
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		15
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		16
animals	birds	Campephagidae	*Lalage sueurii*	white-winged triller		C		1
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		14
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		11

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Campephagidae	*Lalage leucomela*	varied triller		C		1
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		1
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		3
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		R		1
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		8
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		5
animals	birds	Columbidae	*Geophaps scripta*	squatter pigeon		C		8
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		5
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		2
animals	birds	Columbidae	*Geophaps scripta peninsulae*	squatter pigeon (northern subspecies)		C		1
animals	birds	Columbidae	*Macropygia amboinensis*	brown cuckoo-dove		C		1
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		5
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		3
animals	birds	Corvidae	*Corvus sp.*					1
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		15
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		8
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		2
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		4
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		4
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		6
animals	birds	Cuculidae	*Chalcites osculans*	black-eared cuckoo		C		1
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		1
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		1
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		6
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		2
animals	birds	Falconidae	*Falco peregrinus*	peregrine falcon		C		2
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		5
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		1
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		4
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		7
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		19
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		2
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		4
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		1
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		1
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater		C		1
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		3
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		17
animals	birds	Meliphagidae	*Lichenostomus virescens*	singing honeyeater		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		13
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		2
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		17
animals	birds	Meliphagidae	*Lichenostomus unicolor*	white-gaped honeyeater		C		1
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		18
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		11

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	*Lichenostomus fuscus*	fuscous honeyeater		C		1
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		2
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		15
animals	birds	Meliphagidae	*Lichenostomus flavescens*	yellow-tinted honeyeater		C		3
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		9
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		2
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		5
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		12
animals	birds	Monarchidae	*Myiagra cyanoleuca*	satin flycatcher		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		6
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		3
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		3
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		10
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		15
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		2
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		3
animals	birds	Petroicidae	*Microeca flavigaster*	lemon-bellied flycatcher		C		3
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		1
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		5
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		3
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		3
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		1
animals	birds	Psittacidae	*Platycercus eximius*	eastern rosella		C		2/2
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		22
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		15
animals	birds	Psittacidae	*Platycercus adscitus adscitus*	pale-headed rosella (northern form)		C		8
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		23
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus nuchalis*	great bowerbird		C		6
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		7
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		10
animals	birds	Scolopacidae	*Tringa glareola*	wood sandpiper		C		2
animals	birds	Strigidae	*Ninox novaeseelandiae*	southern boobook		C		9
animals	birds	Sturnidae	*Sturnus tristis*	common myna	Y			1
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		4
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		1
animals	bony fish	Eleotridae	*Mogurnda mogurnda*	northern purplespotted gudgeon				1
animals	bony fish	Melanotaeniidae	*Melanotaenia splendida splendida*	eastern rainbowfish				1
animals	mammals	Canidae	*Canis lupus dingo*	dingo				5
animals	mammals	Dasyuridae	*Dasyurus hallucatus*	northern quoll		C	E	1
animals	mammals	Emballonuridae	*Taphozous georgianus*	common sheathtail bat		C		1
animals	mammals	Equidae	*Equus caballus*	horse	Y			1
animals	mammals	Felidae	*Felis catus*	cat	Y			1
animals	mammals	Hipposideridae	*Hipposideros diadema reginae*	diadem leaf-nosed bat		R		1
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			5
animals	mammals	Macropodidae	*Macropus parryi*	whiptail wallaby		C		6
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		10
animals	mammals	Macropodidae	*Macropus antilopinus*	antilopine wallaroo		C		7
animals	mammals	Macropodidae	*Petrogale assimilis*	allied rock-wallaby		C		7
animals	mammals	Macropodidae	*Petrogale mareeba*	Mareeba rock-wallaby		R		4
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		23
animals	mammals	Macropodidae	*Macropus dorsalis*	black-striped wallaby		C		2
animals	mammals	Megadermatidae	*Macroderma gigas*	ghost bat		V		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			1
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		2/1
animals	mammals	Muridae	*Rattus rattus*	black rat	Y			1/1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		2/1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		9
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		9
animals	mammals	Pseudocheiridae	*Petauroides volans*	greater glider		C		1
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Rhinolophidae	*Rhinolophus megaphyllus*	eastern horseshoe-bat		C		35/3
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		C		6
animals	mammals	Vespertilionidae	*Miniopterus sp.*					2
animals	mammals	Vespertilionidae	*Miniopterus australis*	little bent-wing bat		C		27
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		25/5
animals	mammals	Vespertilionidae	*Miniopterus schreibersii oceanensis*	eastern bent-wing bat		C		28
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		3
animals	reptiles	Agamidae	*Diporiphora sp.*					1
animals	reptiles	Agamidae	*Tympanocryptis sp.*					1
animals	reptiles	Agamidae	*Diporiphora australis*			C		3
animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		5
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		5
animals	reptiles	Boidae	*Antaresia stimsoni*			C		11
animals	reptiles	Boidae	*Antaresia maculosa*			C		1
animals	reptiles	Boidae	*Morelia spilota*	carpet python		C		5
animals	reptiles	Chelidae	*Wollumbinia latisternum*	saw-shelled turtle		C		1
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		8
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		2
animals	reptiles	Colubridae	*Dendrelaphis punctulata*	common tree snake		C		2
animals	reptiles	Elapidae	*Suta suta*	myall snake		C		1
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1
animals	reptiles	Elapidae	*Demansia papuensis*	Papuan whip snake		C		1
animals	reptiles	Elapidae	*Demansia vestigiata*	black whip snake		C		1
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		1
animals	reptiles	Elapidae	*Pseudechis australis*	king brown snake		C		1
animals	reptiles	Elapidae	*Acanthophis praelongus*	northern death adder		C		1
animals	reptiles	Elapidae	*Acanthophis antarcticus*	common death adder		R		1
animals	reptiles	Elapidae	*Hoplocephalus bitorquatus*	pale-headed snake		C		1
animals	reptiles	Gekkonidae	*Gehyra nana*			C		1
animals	reptiles	Gekkonidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		C		1
animals	reptiles	Gekkonidae	*Lucasium steindachneri*	Steindachner's gecko		C		1

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animals	reptiles	Gekkonidae	*Nephrurus asper*	spiny knob-tailed gecko		C		3
animals	reptiles	Gekkonidae	*Oedura rhombifer*	zig-zag gecko		C		4
animals	reptiles	Gekkonidae	*Oedura castelnaui*	northern velvet gecko		C		1
animals	reptiles	Gekkonidae	*Strophurus williamsi*	soft-spined gecko		C		1
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		6
animals	reptiles	Gekkonidae	*Oedura coggeri*	northern spotted velvet gecko		C		5
animals	reptiles	Gekkonidae	*Gehyra dubia*			C		4
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		2
animals	reptiles	Scincidae	*Carlia munda*			C		9
animals	reptiles	Scincidae	*Carlia rococo*			R		4
animals	reptiles	Scincidae	*Lerista ameles*			R		5/2
animals	reptiles	Scincidae	*Anomalopus gowi*			C		1
animals	reptiles	Scincidae	*Menetia timlowi*			C		2
animals	reptiles	Scincidae	*Carlia jarnoldae*			C		8
animals	reptiles	Scincidae	*Eulamprus tenuis*			C		6
animals	reptiles	Scincidae	*Lerista zonulata*			C		3
animals	reptiles	Scincidae	*Carlia schmeltzii*			C		4
animals	reptiles	Scincidae	*Bellatorias frerei*	major skink		C		1
animals	reptiles	Scincidae	*Carlia mundivensis*			C		9
animals	reptiles	Scincidae	*Ctenotus spaldingi*			C		7
animals	reptiles	Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		C		1
animals	reptiles	Scincidae	*Notoscincus ornatus*			C		1
animals	reptiles	Scincidae	*Ctenotus essingtonii*			C		3
animals	reptiles	Scincidae	*Ctenotus taeniolatus*	copper-tailed skink		C		4
animals	reptiles	Scincidae	*Eulamprus brachysoma*			C		1
animals	reptiles	Scincidae	*Proablepharus tenuis*			C		3
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		2
animals	reptiles	Scincidae	*Glaphyromorphus cracens*			C		2
animals	reptiles	Scincidae	*Cryptoblepharus pannosus*	ragged snake-eyed skink		C		2
animals	reptiles	Varanidae	*Varanus storri*	Storr's monitor		C		1
fungi	sac fungi	Collemataceae	*Collema*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria applanata*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia speciosa*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia obscurata*			C		1/1
plants	ferns	Adiantaceae	*Cheilanthes brownii*			C		2/2
plants	ferns	Adiantaceae	*Cheilanthes nudiuscula*			C		2/2
plants	ferns	Adiantaceae	*Pityrogramma calomelanos var. calomelanos*		Y			1/1
plants	ferns	Adiantaceae	*Paraceterach muelleri*			C		3/3
plants	ferns	Adiantaceae	*Cheilanthes contigua*			C		1/1
plants	ferns	Davalliaceae	*Davallia denticulata var. denticulata*			C		1/1
plants	ferns	Nephrolepidaceae	*Nephrolepis cordifolia*	fishbone fern		C		1/1
plants	ferns	Thelypteridaceae	*Macrothelypteris torresiana*	pale wood fern		C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia*			C		1
plants	higher dicots	Acanthaceae	*Brunoniella acaulis subsp. acaulis*			C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia adscendens subsp. glaucoviolacea*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Acanthaceae	*Pseuderanthemum variabile*	pastel flower		C		2/2
plants	higher dicots	Acanthaceae	*Brunoniella acaulis*			C		1
plants	higher dicots	Acanthaceae	*Brunoniella australis*	blue trumpet		C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		4/3
plants	higher dicots	Amaranthaceae	*Alternanthera nana*	hairy joyweed		C		2/2
plants	higher dicots	Amaranthaceae	*Gomphrena flaccida*			C		1/1
plants	higher dicots	Amaranthaceae	*Amaranthus interruptus*			C		1/1
plants	higher dicots	Amaranthaceae	*Deeringia amaranthoides*	redberry		C		1/1
plants	higher dicots	Anacardiaceae	*Euroschinus falcatus*			C		1
plants	higher dicots	Anacardiaceae	*Pleiogynium timorense*	Burdekin plum		C		2/1
plants	higher dicots	Anacardiaceae	*Euroschinus falcatus var. angustifolius*			C		1/1
plants	higher dicots	Apiaceae	*Platysace valida*			C		1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		2/2
plants	higher dicots	Apocynaceae	*Wrightia saligna*			C		3/3
plants	higher dicots	Apocynaceae	*Wrightia versicolor*			C		3/3
plants	higher dicots	Apocynaceae	*Parsonsia lanceolata*	northern silkpod		C		5/5
plants	higher dicots	Apocynaceae	*Parsonsia plaesiophylla*			C		2/2
plants	higher dicots	Apocynaceae	*Sarcostemma viminale subsp. brunonianum*			C		1/1
plants	higher dicots	Apocynaceae	*Marsdenia viridiflora subsp. tropica*			C		6/6
plants	higher dicots	Apocynaceae	*Cynanchum pedunculatum*			C		1/1
plants	higher dicots	Apocynaceae	*Cynanchum leptolepis*			C		3/3
plants	higher dicots	Apocynaceae	*Secamone elliptica*			C		3/3
plants	higher dicots	Apocynaceae	*Calotropis procera*		Y			2/2
plants	higher dicots	Araliaceae	*Polyscias elegans*	celery wood		C		2/2
plants	higher dicots	Araliaceae	*Trachymene bivestita var. pterocarpa*			C		3/3
plants	higher dicots	Araliaceae	*Hydrocotyle acutiloba*			C		1/1
plants	higher dicots	Araliaceae	*Trachymene bivestita var. bivestita*			C		1/1
plants	higher dicots	Asteraceae	*Asteraceae*			C		2
plants	higher dicots	Asteraceae	*Tagetes minuta*	stinking roger	Y			1/1
plants	higher dicots	Asteraceae	*Bidens bipinnata*	bipinnate beggar's ticks	Y			2/1
plants	higher dicots	Asteraceae	*Sonchus oleraceus*	common sowthistle	Y			2/2
plants	higher dicots	Asteraceae	*Camptacra gracilis*			C		1/1
plants	higher dicots	Asteraceae	*Conyza sumatrensis*	tall fleabane	Y			1/1
plants	higher dicots	Asteraceae	*Acmella grandiflora*			C		1
plants	higher dicots	Asteraceae	*Wollastonia biflora*			C		1
plants	higher dicots	Asteraceae	*Acmella grandiflora var. brachyglossa*			C		1/1
plants	higher dicots	Asteraceae	*Peripleura hispidula var. hispidula*			C		3/3
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		1/1
plants	higher dicots	Asteraceae	*Xerochrysum bracteatum*	golden everlasting daisy		C		2/2
plants	higher dicots	Asteraceae	*Wedelia spilanthoides*			C		3/3
plants	higher dicots	Asteraceae	*Cyanthillium cinereum*			C		6/4
plants	higher dicots	Asteraceae	*Pterocaulon redolens*			C		2
plants	higher dicots	Asteraceae	*Praxelis clematidea*		Y			5/5
plants	higher dicots	Asteraceae	*Peripleura diffusa*			C		1/1
plants	higher dicots	Asteraceae	*Conyza bonariensis*		Y			1/1
plants	higher dicots	Asteraceae	*Tridax procumbens*	tridax daisy	Y			2/1

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plants	higher dicots	Asteraceae	*Camptacra barbata*			C		10/10
plants	higher dicots	Bignoniaceae	*Pandorea pandorana*	wonga vine		C		3/3
plants	higher dicots	Bignoniaceae	*Dolichandrone heterophylla*			C		1/1
plants	higher dicots	Boraginaceae	*Cordia dichotoma*			C		2/2
plants	higher dicots	Boraginaceae	*Trichodesma zeylanicum var. zeylanicum*			C		2/2
plants	higher dicots	Boraginaceae	*Heliotropium cunninghamii*			C		2/2
plants	higher dicots	Boraginaceae	*Heliotropium tenuifolium*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium indicum*		Y			1/1
plants	higher dicots	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium consimile*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium peninsulare*			C		3/3
plants	higher dicots	Boraginaceae	*Trichodesma zeylanicum*			C		1/1
plants	higher dicots	Burseraceae	*Canarium australianum var. australianum*			C		1/1
plants	higher dicots	Byttneriaceae	*Waltheria indica*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Cassia*			C		1
plants	higher dicots	Caesalpiniaceae	*Erythrophleum chlorostachys*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista exigua var. minor*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna sophera var. (40Mile Scrub J.R.Clarkson+ 6908)*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista nomame var. nomame*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista exigua var. exigua*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista absus var. absus*			C		3/3
plants	higher dicots	Caesalpiniaceae	*Chamaecrista mimosoides*	dwarf cassia		C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna gaudichaudii*			C		2/2
plants	higher dicots	Caesalpiniaceae	*Chamaecrista nomame*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Lysiphyllum hookeri*	Queensland ebony		C		2/2
plants	higher dicots	Campanulaceae	*Pratia concolor*	poison pratia		C		1/1
plants	higher dicots	Campanulaceae	*Lobelia membranacea*			C		1/1
plants	higher dicots	Campanulaceae	*Lobelia quadrangularis*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia graniticola*	granite bluebell		C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia communis*	tufted bluebell		C		1/1
plants	higher dicots	Capparaceae	*Capparis*			C		1
plants	higher dicots	Capparaceae	*Capparis arborea*	brush caper berry		C		1/1
plants	higher dicots	Capparaceae	*Capparis shanesiana*			C		1/1
plants	higher dicots	Capparaceae	*Capparis canescens*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa*			C		3
plants	higher dicots	Caryophyllaceae	*Polycarpaea multicaulis*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea spirostylis*			C		2
plants	higher dicots	Caryophyllaceae	*Polycarpaea spirostylis subsp. spirostylis*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa var. corymbosa*			C		1/1
plants	higher dicots	Celastraceae	*Denhamia oleaster*			C		1/1
plants	higher dicots	Celastraceae	*Maytenus disperma*	orange boxwood		C		1/1
plants	higher dicots	Celastraceae	*Maytenus cunninghamii*	yellow berry bush		C		3/1
plants	higher dicots	Celastraceae	*Elaeodendron melanocarpum*			C		1/1
plants	higher dicots	Celastraceae	*Siphonodon australis*	ivorywood		C		1/1
plants	higher dicots	Cleomaceae	*Cleome*			C		3/3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Cleomaceae	*Cleome monophylla*		Y			3/3
plants	higher dicots	Cleomaceae	*Cleome gynandra*		Y			1/1
plants	higher dicots	Cleomaceae	*Cleome viscosa*	tick-weed		C		3/3
plants	higher dicots	Cochlospermaceae	*Cochlospermum gregorii*			C		2/2
plants	higher dicots	Cochlospermaceae	*Cochlospermum gillivraei*			C		2/1
plants	higher dicots	Combretaceae	*Terminalia aridicola*			C		1/1
plants	higher dicots	Combretaceae	*Terminalia aridicola subsp. aridicola*			C		1/1
plants	higher dicots	Combretaceae	*Terminalia aridicola subsp. chillagoensis*			C		2/2
plants	higher dicots	Convolvulaceae	*Polymeria*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea argillicola*			C		7/7
plants	higher dicots	Convolvulaceae	*Ipomoea polymorpha*			C		2/1
plants	higher dicots	Convolvulaceae	*Polymeria ambigua*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea eriocarpa*			C		4/2
plants	higher dicots	Convolvulaceae	*Merremia quinata*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea plebeia*	bellvine		C		4/4
plants	higher dicots	Convolvulaceae	*Ipomoea brownii*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea polpha*			C		3/2
plants	higher dicots	Convolvulaceae	*Jacquemontia*			C		2/1
plants	higher dicots	Convolvulaceae	*Polymeria sp. (Chillagoe K.R.McDonald KRM328)*			C		2/2
plants	higher dicots	Convolvulaceae	*Jacquemontia sp. (Fairview R.W.Johnson 4026)*			C		2/2
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides var. sericeus*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea gracilis var. sagittata*			C		5/5
plants	higher dicots	Convolvulaceae	*Ipomoea polpha subsp. polpha*			C		3/3
plants	higher dicots	Convolvulaceae	*Ipomoea saintronanensis*			R		4/4
plants	higher dicots	Convolvulaceae	*Xenostegia tridentata*			C		2/2
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		1
plants	higher dicots	Convolvulaceae	*Ipomoea nil*		Y			4/3
plants	higher dicots	Crassulaceae	*Bryophyllum x houghtonii*		Y			1/1
plants	higher dicots	Cucurbitaceae	*Cucurbita*			C		2
plants	higher dicots	Cucurbitaceae	*Cucurbitaceae*			C		2/2
plants	higher dicots	Cucurbitaceae	*Sicyos australis*	star cucumber		C		1/1
plants	higher dicots	Cucurbitaceae	*Mukia maderaspatana*			C		5/4
plants	higher dicots	Cucurbitaceae	*Trichosanthes ovigera*			C		2/2
plants	higher dicots	Cucurbitaceae	*Cucumis melo subsp. agrestis*			C		1/1
plants	higher dicots	Cucurbitaceae	*Trichosanthes holtzei*			C		2/2
plants	higher dicots	Ebenaceae	*Diospyros humilis*	small-leaved ebony		C		1/1
plants	higher dicots	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		1/1
plants	higher dicots	Erythroxylaceae	*Erythroxylum ellipticum*			C		4/4
plants	higher dicots	Euphorbiaceae	*Mallotus philippensis*	red kamala		C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			C		1/1
plants	higher dicots	Euphorbiaceae	*Claoxylon tenerifolium subsp. tenerifolium*			C		1/1
plants	higher dicots	Euphorbiaceae	*Chamaesyce mitchelliana*			C		4/4
plants	higher dicots	Euphorbiaceae	*Croton arnhemicus*			C		1/1
plants	higher dicots	Euphorbiaceae	*Chamaesyce bifida*			C		4/4
plants	higher dicots	Euphorbiaceae	*Chamaesyce hirta*	asthma plant	Y			2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia*			C		3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Euphorbiaceae	*Microstachys chamaelea*			C		2/2
plants	higher dicots	Fabaceae	*Galactia sp. (Myall Creek J.R.Clarkson 4885)*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria*			C		2
plants	higher dicots	Fabaceae	*Stylosanthes*			C		2
plants	higher dicots	Fabaceae	*Rhynchosia minima*			C		3
plants	higher dicots	Fabaceae	*Glycine syndetika*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria juncea*	sunhemp	Y			1/1
plants	higher dicots	Fabaceae	*Canavalia papuana*	wild jack bean		C		2/2
plants	higher dicots	Fabaceae	*Abrus precatorius*	crabs-eye vine		C		1
plants	higher dicots	Fabaceae	*Hovea parvicalyx*			C		4/4
plants	higher dicots	Fabaceae	*Desmodium hannii*			C		1/1
plants	higher dicots	Fabaceae	*Hovea longipes*	brush hovea		C		3/3
plants	higher dicots	Fabaceae	*Uraria picta*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera scabrella*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera pratensis*			C		10/7
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		3/2
plants	higher dicots	Fabaceae	*Crotalaria verrucosa*			C		2/2
plants	higher dicots	Fabaceae	*Crotalaria goreensis*	gambia pea	Y			1/1
plants	higher dicots	Fabaceae	*Aeschynomene villosa*		Y			1/1
plants	higher dicots	Fabaceae	*Tephrosia barbatala*			C		1/1
plants	higher dicots	Fabaceae	*Desmodium tortuosum*	Florida beggar-weed	Y			1/1
plants	higher dicots	Fabaceae	*Cajanus acutifolius*			C		4/4
plants	higher dicots	Fabaceae	*Vigna sp. (Station Creek R.J.Lawn CQ3284)*			C		2/2
plants	higher dicots	Fabaceae	*Crotalaria lanceolata subsp. lanceolata*		Y			1/1
plants	higher dicots	Fabaceae	*Galactia sp. (Laura J.C.Tothill JT53A)*			C		4/4
plants	higher dicots	Fabaceae	*Zornia muelleriana subsp. muelleriana*			C		1/1
plants	higher dicots	Fabaceae	*Phyllodium pulchellum var. pulchellum*			R		1/1
plants	higher dicots	Fabaceae	*Crotalaria montana var. angustifolia*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria medicaginea var. neglecta*			C		4/4
plants	higher dicots	Fabaceae	*Cajanus reticulatus var. reticulatus*			C		2/2
plants	higher dicots	Fabaceae	*Zornia muriculata subsp. angustata*			C		5/4
plants	higher dicots	Fabaceae	*Galactia tenuiflora var. macrantha*			C		1/1
plants	higher dicots	Fabaceae	*Vigna vexillata var. angustifolia*			C		3/3
plants	higher dicots	Fabaceae	*Vigna lanceolata var. lanceolata*			C		10/9
plants	higher dicots	Fabaceae	*Vigna lanceolata var. filiformis*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia purpurea var. sericea*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia filipes forma vestita*			C		2/2
plants	higher dicots	Fabaceae	*Vigna vexillata var. youngiana*			C		4/4
plants	higher dicots	Fabaceae	*Rhynchosia minima var. minima*			C		3/3
plants	higher dicots	Fabaceae	*Vigna radiata var. sublobata*			C		2/2
plants	higher dicots	Fabaceae	*Macroptilium atropurpureum*	siratro	Y			1/1
plants	higher dicots	Fabaceae	*Desmodium rhytidophyllum*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia astragaloides*			C		1/1
plants	higher dicots	Fabaceae	*Indigastrum parviflorum*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria laburnifolia*		Y			1/1
plants	higher dicots	Fabaceae	*Crotalaria spectabilis*	showy rattlepod	Y			2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Fabaceae	*Crotalaria medicaginea*	trefoil rattlepod		C		2
plants	higher dicots	Fabaceae	*Tephrosia flagellaris*			C		2/2
plants	higher dicots	Fabaceae	*Erythrina vespertilio*			C		2
plants	higher dicots	Fabaceae	*Desmodium brachypodum*	large ticktrefoil		C		5/5
plants	higher dicots	Fabaceae	*Uraria lagopodioides*			C		1/1
plants	higher dicots	Fabaceae	*Pultenaea petiolaris*			C		1/1
plants	higher dicots	Fabaceae	*Jacksonia thesioides*			C		1/1
plants	higher dicots	Fabaceae	*Zornia muelleriana*			C		1
plants	higher dicots	Fabaceae	*Indigofera linnaei*	Birdsville indigo		C		6/4
plants	higher dicots	Fabaceae	*Indigofera hirsuta*	hairy indigo		C		3/3
plants	higher dicots	Fabaceae	*Indigofera colutea*	sticky indigo		C		3/2
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		3/3
plants	higher dicots	Fabaceae	*Crotalaria montana*			C		2
plants	higher dicots	Fabaceae	*Zornia stirlingii*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia varians*			C		3/3
plants	higher dicots	Fabaceae	*Indigofera*			C		4/2
plants	higher dicots	Fabaceae	*Tephrosia*			C		2/1
plants	higher dicots	Fabaceae	*Tephrosia astragaloides var. (Belyando Crossing E.J.Thompson+ 139)*			C		1/1
plants	higher dicots	Fabaceae	*Vigna*			C		2/1
plants	higher dicots	Fabaceae	*Glycine*			C		4/4
plants	higher dicots	Fabaceae	*Zornia*			C		4/3
plants	higher dicots	Fabaceae	*Tephrosia sp. (Copperfield River P.I.Forster PIF14768)*			C		3/3
plants	higher dicots	Flacourtiaceae	*Homalium brachybotrys*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia pilosa*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia armitiana*			C		3/3
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1/1
plants	higher dicots	Haloragaceae	*Myriophyllum aquaticum*	Brazilian water milfoil	Y			1/1
plants	higher dicots	Haloragaceae	*Myriophyllum filiforme*			C		1/1
plants	higher dicots	Haloragaceae	*Myriophyllum verrucosum*	water milfoil		C		1/1
plants	higher dicots	Lamiaceae	*Ajuga australis*	Australian bugle		C		1/1
plants	higher dicots	Lamiaceae	*Glossocarya calcicola*			C		1/1
plants	higher dicots	Lamiaceae	*Plectranthus parviflorus*			C		2/2
plants	higher dicots	Lamiaceae	*Clerodendrum floribundum*			C		1/1
plants	higher dicots	Lamiaceae	*Clerodendrum tomentosum*			C		1/1
plants	higher dicots	Lamiaceae	*Plectranthus congestus*			C		1/1
plants	higher dicots	Lamiaceae	*Glossocarya hemiderma*			C		1/1
plants	higher dicots	Lamiaceae	*Anisomeles malabarica*			C		1/1
plants	higher dicots	Lamiaceae	*Premna acuminata*			C		2/2
plants	higher dicots	Lamiaceae	*Plectranthus mirus*			C		2/2
plants	higher dicots	Lamiaceae	*Premna dallachyana*			C		3/3
plants	higher dicots	Lamiaceae	*Callicarpa candicans*			C		2/2
plants	higher dicots	Lamiaceae	*Teucrium argutum*			C		1/1
plants	higher dicots	Lecythidaceae	*Planchonia careya*	cockatoo apple		C		4/1
plants	higher dicots	Lentibulariaceae	*Utricularia dichotoma*	fairy aprons		C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Loganiaceae	*Strychnos lucida*			C		2/2
plants	higher dicots	Loganiaceae	*Strychnos psilosperma*	strychnine tree		C		1/1
plants	higher dicots	Loranthaceae	*Amyema cambagei*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema congener subsp. rotundifolia*			C		3/3
plants	higher dicots	Loranthaceae	*Dendrophthoe glabrescens*			C		2/2
plants	higher dicots	Loranthaceae	*Lysiana filifolia*			R		1/1
plants	higher dicots	Loranthaceae	*Amyema biniflora*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema villiflora subsp. tomentilla*			C		1/1
plants	higher dicots	Lythraceae	*Lythrum paradoxum*			C		1/1
plants	higher dicots	Lythraceae	*Rotala tripartita*			C		2/2
plants	higher dicots	Lythraceae	*Rotala occultiflora*			C		1/1
plants	higher dicots	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1/1
plants	higher dicots	Malpighiaceae	*Ryssopterys timorensis*			C		2/2
plants	higher dicots	Malvaceae	*Hibiscus*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus meraukensis*	Merauke hibiscus		C		5/5
plants	higher dicots	Malvaceae	*Sida rohlenae subsp. rohlenae*			C		1/1
plants	higher dicots	Malvaceae	*Abelmoschus moschatus subsp. tuberosus*			C		1/1
plants	higher dicots	Malvaceae	*Malvastrum americanum var. americanum*		Y			1/1
plants	higher dicots	Malvaceae	*Abutilon micropetalum*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus divaricatus*			C		1/1
plants	higher dicots	Malvaceae	*Sida acuta*	spinyhead sida	Y			1
plants	higher dicots	Malvaceae	*Sida aprica*			C		1
plants	higher dicots	Malvaceae	*Sida magnifica*			C		2/2
plants	higher dicots	Meliaceae	*Melia azedarach*	white cedar		C		2/2
plants	higher dicots	Meliaceae	*Turraea pubescens*	native honeysuckle		C		6/6
plants	higher dicots	Mimosaceae	*Acacia humifusa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia bidwillii*			C		6/3
plants	higher dicots	Mimosaceae	*Acacia umbellata*			C		3/3
plants	higher dicots	Mimosaceae	*Acacia disparrima subsp. calidestris*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia julifera subsp. gilbertensis*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia holosericea var. glabrata*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia multisiliqua*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia jackesiana*			R		4/4
plants	higher dicots	Mimosaceae	*Acacia galioides*			C		1/1
plants	higher dicots	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		3/3
plants	higher dicots	Moraceae	*Ficus*			C		1
plants	higher dicots	Moraceae	*Ficus virens var. virens*			C		1/1
plants	higher dicots	Moraceae	*Ficus rubiginosa forma rubiginosa*			C		4/4
plants	higher dicots	Moraceae	*Ficus virens var. sublanceolata*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia*			C		2
plants	higher dicots	Myrtaceae	*Corymbia terminalis*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia dallachiana*			C		5/3
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		4/3
plants	higher dicots	Myrtaceae	*Lophostemon grandiflorus subsp. grandiflorus*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus tereticornis subsp. tereticornis*			C		1/1

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plants	higher dicots	Myrtaceae	*Lophostemon grandiflorus*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus leptophleba*	Molloy red box		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus chloroclada*	Baradine red gum		C		1
plants	higher dicots	Myrtaceae	*Corymbia erythrophloia*	variable-barked bloodwood		C		3/3
plants	higher dicots	Myrtaceae	*Corymbia confertiflora*			C		2/1
plants	higher dicots	Myrtaceae	*Melaleuca leucadendra*	broad-leaved tea-tree		C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus microneura*	Gilbert River box		C		2/1
plants	higher dicots	Myrtaceae	*Eucalyptus chartaboma*			C		2/2
plants	higher dicots	Myrtaceae	*Corymbia ellipsoidea*			C		2/2
plants	higher dicots	Myrtaceae	*Calytrix leptophylla*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		C		7/5
plants	higher dicots	Myrtaceae	*Eucalyptus*			C		2
plants	higher dicots	Myrtaceae	*Gossia bidwillii*			C		4/4
plants	higher dicots	Nyctaginaceae	*Boerhavia pubescens*			C		2/2
plants	higher dicots	Oleaceae	*Olea paniculata*			C		3/3
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. racemosum*			C		1/1
plants	higher dicots	Oleaceae	*Notelaea microcarpa var. microcarpa*			C		1/1
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. lineare*			C		1/1
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		2/2
plants	higher dicots	Pentapetaceae	*Melhania brachycarpa*			C		2/2
plants	higher dicots	Phyllanthaceae	*Breynia*			C		1
plants	higher dicots	Phyllanthaceae	*Breynia oblongifolia*			C		4/3
plants	higher dicots	Phyllanthaceae	*Antidesma parvifolium*			C		4/4
plants	higher dicots	Phyllanthaceae	*Phyllanthus novae-hollandiae*			C		2/2
plants	higher dicots	Phyllanthaceae	*Flueggea virosa subsp. melanthesoides*			C		1
plants	higher dicots	Phyllanthaceae	*Bridelia leichhardtii*			C		2/2
plants	higher dicots	Phyllanthaceae	*Phyllanthus collinus*			C		1/1
plants	higher dicots	Phyllanthaceae	*Flueggea leucopyrus*			C		4/4
plants	higher dicots	Phyllanthaceae	*Phyllanthus*			C		3/3
plants	higher dicots	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		3/2
plants	higher dicots	Pittosporaceae	*Bursaria incana*			C		5/3
plants	higher dicots	Pittosporaceae	*Pittosporum spinescens*			C		1/1
plants	higher dicots	Pittosporaceae	*Bursaria spinosa*			C		1
plants	higher dicots	Pittosporaceae	*Auranticarpa edentata*			C		2/2
plants	higher dicots	Plumbaginaceae	*Plumbago zeylanica*	native plumbago		C		3/3
plants	higher dicots	Polygalaceae	*Polygala*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala sp. (Portland Roads L.Pedley 2757)*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala rhinanthoides*			C		1/1
plants	higher dicots	Polygonaceae	*Polygonum plebeium*	small knotweed		C		1/1
plants	higher dicots	Portulacaceae	*Portulaca*			C		2/2
plants	higher dicots	Portulacaceae	*Portulaca bicolor*			C		2/2
plants	higher dicots	Portulacaceae	*Portulaca digyna*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca oleracea*	pigweed	Y			1/1
plants	higher dicots	Portulacaceae	*Grahamia australiana*			C		1/1
plants	higher dicots	Portulacaceae	*Calandrinia uniflora*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca filifolia*			C		1/1

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plants	higher dicots	Portulacaceae	*Portulaca australis*			C		2/1
plants	higher dicots	Primulaceae	*Anagallis pumila*			C		1/1
plants	higher dicots	Proteaceae	*Hakea lorea*			C		1
plants	higher dicots	Proteaceae	*Grevillea glauca*	bushy's clothes peg		C		1
plants	higher dicots	Proteaceae	*Persoonia falcata*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea mimosoides*			C		5/3
plants	higher dicots	Proteaceae	*Grevillea parallela*			C		1
plants	higher dicots	Putranjivaceae	*Drypetes*			C		1
plants	higher dicots	Rhamnaceae	*Alphitonia*			C		1
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		1/1
plants	higher dicots	Rubiaceae	*Canthium*			C		1
plants	higher dicots	Rubiaceae	*Pavetta australiensis*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		1/1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides subsp. mitrasacmoides*			C		1/1
plants	higher dicots	Rubiaceae	*Psychotria daphnoides var. angustifolia*			C		3/3
plants	higher dicots	Rubiaceae	*Everistia vacciniifolia forma crassa*			C		2/2
plants	higher dicots	Rubiaceae	*Psydrax saligna forma saligna*			C		1/1
plants	higher dicots	Rubiaceae	*Psychotria loniceroides*	hairy psychotria		C		1
plants	higher dicots	Rubiaceae	*Psychotria daphnoides*			C		1/1
plants	higher dicots	Rubiaceae	*Larsenaikia ochreata*			C		2/2
plants	higher dicots	Rubiaceae	*Psydrax odorata*			C		1/1
plants	higher dicots	Rubiaceae	*Pavetta granitica*			C		3/3
plants	higher dicots	Rutaceae	*Micromelum minutum*	clusterberry		C		1/1
plants	higher dicots	Rutaceae	*Murraya ovatifoliolata*			C		2/2
plants	higher dicots	Rutaceae	*Geijera salicifolia*	brush wilga		C		3/3
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		2/1
plants	higher dicots	Sapindaceae	*Atalaya calcicola*			R		3/3
plants	higher dicots	Sapindaceae	*Cupaniopsis parvifolia*	small-leaved tuckeroo		C		1/1
plants	higher dicots	Sapindaceae	*Cupaniopsis anacardioides*	tuckeroo		C		1
plants	higher dicots	Sapindaceae	*Distichostemon dodecandrus*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea lanceolata var. subsessilifolia*			C		2/2
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		2
plants	higher dicots	Sapindaceae	*Alectryon connatus*	grey birds-eye		C		2/2
plants	higher dicots	Sapotaceae	*Pouteria sericea*			C		1
plants	higher dicots	Sapotaceae	*Pianchonella pohlmaniana var. (Gilbert River C.T.White 1409)*			C		1/1
plants	higher dicots	Sapotaceae	*Sersalisia sericea*			C		2/2
plants	higher dicots	Scrophulariaceae	*Bacopa monnieri*			C		1/1
plants	higher dicots	Scrophulariaceae	*Mimulus aquatilis*			C		2/2
plants	higher dicots	Scrophulariaceae	*Limnophila brownii*			C		1/1
plants	higher dicots	Scrophulariaceae	*Buchnera ramosissima*			C		1/1
plants	higher dicots	Scrophulariaceae	*Lindernia anagallis*			C		1/1
plants	higher dicots	Scrophulariaceae	*Lindernia subulata*			C		1/1
plants	higher dicots	Scrophulariaceae	*Stemodia glabella*			C		1/1
plants	higher dicots	Simaroubaceae	*Ailanthus triphysa*	white siris		C		1/1
plants	higher dicots	Solanaceae	*Solanum*			C		1

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plants	higher dicots	Solanaceae	*Solanum lycopersicum var. cerasiforme*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum americanum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum seaforthianum*	Brazilian nightshade	Y			1/1
plants	higher dicots	Solanaceae	*Solanum multiglochidiatum*			R		9/9
plants	higher dicots	Solanaceae	*Solanum parvifolium subsp. tropicum*			C		2/2
plants	higher dicots	Solanaceae	*Solanum nigrum subsp. nigrum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum erianthum*	potato tree	Y			1/1
plants	higher dicots	Solanaceae	*Solanum angustum*			C		2/2
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia*			C		1
plants	higher dicots	Sparrmanniaceae	*Corchorus trilocularis*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Corchorus tridens*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia mesomischa*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia papuana*			C		4/4
plants	higher dicots	Sparrmanniaceae	*Grewia retusifolia*			C		6/2
plants	higher dicots	Sparrmanniaceae	*Corchorus aestuans*			C		1
plants	higher dicots	Sterculiaceae	*Brachychiton*			C		1
plants	higher dicots	Sterculiaceae	*Brachychiton albidus*			R		8/8
plants	higher dicots	Sterculiaceae	*Brachychiton diversifolius subsp. orientalis*			C		1/1
plants	higher dicots	Sterculiaceae	*Brachychiton chillagoensis*			C		4/4
plants	higher dicots	Stylidiaceae	*Stylidium floodii*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium oviflorum*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium eriorhizum*			C		2/2
plants	higher dicots	Stylidiaceae	*Stylidium schizanthum*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium rotundifolium*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium fissilobum*			C		1/1
plants	higher dicots	Thymelaeaceae	*Wikstroemia indica*	tie bush		C		3/1
plants	higher dicots	Ulmaceae	*Trema tomentosa*			C		2/2
plants	higher dicots	Ulmaceae	*Trema tomentosa var. aspera*			C		2/2
plants	higher dicots	Urticaceae	*Pipturus argenteus*	white nettle		C		1/1
plants	higher dicots	Urticaceae	*Laportea interrupta*			C		2/2
plants	higher dicots	Urticaceae	*Pouzolzia zeylanica*			C		1/1
plants	higher dicots	Verbenaceae	*Lantana camara*		Y			2/2
plants	higher dicots	Violaceae	*Hybanthus enneaspermus*			C		6/4
plants	higher dicots	Violaceae	*Hybanthus stellarioides*			C		1/1
plants	higher dicots	Viscaceae	*Viscum articulatum*	flat mistletoe		C		1/1
plants	higher dicots	Viscaceae	*Viscum whitei subsp. whitei*			C		1/1
plants	higher dicots	Vitaceae	*Cissus opaca*			C		1
plants	higher dicots	Vitaceae	*Cayratia trifolia*			C		6/3
plants	higher dicots	Vitaceae	*Cissus oblonga*			C		1/1
plants	higher dicots	Vitaceae	*Cissus reniformis*			C		2/2
plants	higher dicots	Vitaceae	*Clematicissus opaca*			C		3/3
plants	higher dicots	Vitaceae	*Tetrastigma petraeum*			C		1/1
plants	higher dicots	Vitaceae	*Tetrastigma nitens*	shining grape		C		1/1
plants	higher dicots	Zygophyllaceae	*Tribulus terrestris*	caltrop		C		1/1
plants	higher dicots	Zygophyllaceae	*Tribulopis pentandra*			C		1/1

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plants	lower dicots	Annonaceae	*Melodorum leichhardtii*			C		2/2
plants	lower dicots	Aristolochiaceae	*Aristolochia thozetii*			C		1/1
plants	lower dicots	Aristolochiaceae	*Aristolochia pubera var. aromatica*			C		1/1
plants	lower dicots	Hernandiaceae	*Gyrocarpus americanus subsp. sphenopterus*			C		1/1
plants	lower dicots	Menispermaceae	*Stephania japonica*			C		1
plants	lower dicots	Menispermaceae	*Stephania japonica var. discolor*			C		1/1
plants	lower dicots	Menispermaceae	*Stephania japonica var. timoriensis*			C		1/1
plants	lower dicots	Menispermaceae	*Stephania bancroftii*			C		1/1
plants	lower dicots	Piperaceae	*Peperomia blanda var. floribunda*			C		1/1
plants	monocots	Amaryllidaceae	*Crinum flaccidum*	Murray lily		C		1/1
plants	monocots	Amaryllidaceae	*Proiphys amboinensis*			C		1/1
plants	monocots	Centrolepidaceae	*Centrolepis exserta*			C		1/1
plants	monocots	Commelinaceae	*Commelina lanceolata*			C		1/1
plants	monocots	Commelinaceae	*Cyanotis axillaris*			C		2/2
plants	monocots	Commelinaceae	*Murdannia cryptantha*			C		3/3
plants	monocots	Commelinaceae	*Murdannia nudiflora*		Y			1/1
plants	monocots	Commelinaceae	*Aneilema siliculosum*			C		1/1
plants	monocots	Commelinaceae	*Commelina ensifolia*	scurvy grass		C		5/5
plants	monocots	Commelinaceae	*Murdannia graminea*	murdannia		C		2/2
plants	monocots	Cyperaceae	*Cyperus nutans var. eleusinoides*	flatsedge		C		2/2
plants	monocots	Cyperaceae	*Fuirena incrassata*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis atropurpurea*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus validus*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis tetragona*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		1/1
plants	monocots	Cyperaceae	*Cyperus sanguinolentus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus macrostachyos*			C		1/1
plants	monocots	Cyperaceae	*Scleria tricuspidata*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis simplex*			C		2/2
plants	monocots	Cyperaceae	*Cyperus gerangustus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus haspan subsp. juncoides*			C		1/1
plants	monocots	Cyperaceae	*Cyperus haspan subsp. haspan*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis cinnamometorum*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus mucronatus*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis depauperata*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis sieberiana*			C		3/3
plants	monocots	Cyperaceae	*Cyperus squarrosus*	bearded flatsedge		C		1/1
plants	monocots	Cyperaceae	*Scleria*			C		1
plants	monocots	Cyperaceae	*Scleria brownii*			C		1/1
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		1/1
plants	monocots	Cyperaceae	*Fimbristylis rara*			C		1/1
plants	monocots	Cyperaceae	*Cyperus scaber*			C		2/2
plants	monocots	Cyperaceae	*Cyperus*			C		1
plants	monocots	Dioscoreaceae	*Dioscorea transversa*	native yam		C		4/4
plants	monocots	Hemerocallidaceae	*Dianella*			C		2/2
plants	monocots	Hemerocallidaceae	*Dianella nervosa*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Laxmanniaceae	*Eustrephus latifolius*	wombat berry		C		4/3
plants	monocots	Orchidaceae	*Dipodium elegantulum*			C		3/3
plants	monocots	Orchidaceae	*Cymbidium canaliculatum*			C		2
plants	monocots	Poaceae	*Tragus*			C		2
plants	monocots	Poaceae	*Urochloa*			C		1
plants	monocots	Poaceae	*Enneapogon*			C		2
plants	monocots	Poaceae	*Urochloa holosericea subsp. holosericea*			C		1/1
plants	monocots	Poaceae	*Leptochloa decipiens subsp. asthenes*			C		1/1
plants	monocots	Poaceae	*Dichanthium sericeum subsp. sericeum*			C		1/1
plants	monocots	Poaceae	*Echinochloa polystachya cv. Amity*		Y			1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		1/1
plants	monocots	Poaceae	*Arthragrostis aristispicula*			C		1/1
plants	monocots	Poaceae	*Capillipedium parviflorum*	scented top		C		1/1
plants	monocots	Poaceae	*Enneapogon robustissimus*			C		1/1
plants	monocots	Poaceae	*Ancistrachne uncinulata*	hooky grass		C		2/2
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			1/1
plants	monocots	Poaceae	*Eragrostis cilianensis*		Y			2/2
plants	monocots	Poaceae	*Echinochloa crus-galli*	barnyard grass	Y			1/1
plants	monocots	Poaceae	*Brachyachne convergens*	common native couch		C		1
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		1/1
plants	monocots	Poaceae	*Heteropogon triticeus*	giant speargrass		C		4
plants	monocots	Poaceae	*Sarga plumosum*			C		3
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			5
plants	monocots	Poaceae	*Schizachyrium*			C		1
plants	monocots	Poaceae	*Perotis rara*	comet grass		C		3
plants	monocots	Poaceae	*Bothriochloa*			C		1
plants	monocots	Poaceae	*Alloteropsis*			C		1
plants	monocots	Poaceae	*Dichanthium*			C		2
plants	monocots	Poaceae	*Arundinella*			C		1
plants	monocots	Poaceae	*Sporobolus*			C		1
plants	monocots	Poaceae	*Heteropogon contortus*	black speargrass		C		4
plants	monocots	Poaceae	*Cymbopogon bombycinus*	silky oilgrass		C		1/1
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Urochloa praetervisa*			C		1
plants	monocots	Poaceae	*Tripogon loliiformis*	five minute grass		C		1/1
plants	monocots	Poaceae	*Themeda quadrivalvis*	grader grass	Y			2/1
plants	monocots	Poaceae	*Bothriochloa pertusa*		Y			1/1
plants	monocots	Poaceae	*Tragus australianus*	small burr grass		C		1/1
plants	monocots	Poaceae	*Aristida gracilipes*			C		1/1
plants	monocots	Poaceae	*Setaria sphacelata*		Y			1
plants	monocots	Poaceae	*Pennisetum ciliare*		Y			1
plants	monocots	Poaceae	*Panicum trichoides*			C		1/1
plants	monocots	Poaceae	*Eriachne mucronata*			C		1/1
plants	monocots	Poaceae	*Digitaria bicornis*			C		1/1
plants	monocots	Poaceae	*Themeda triandra*	kangaroo grass		C		5/1
plants	monocots	Poaceae	*Lepturus minutus*			V		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Digitaria minima*			C		1/1
plants	monocots	Poaceae	*Cymbopogon*			C		2
plants	monocots	Poaceae	*Iseilema*			C		1
plants	monocots	Poaceae	*Chloris*			C		1
plants	monocots	Poaceae	*Panicum*			C		2
plants	monocots	Poaceae	*Aristida*			C		4
plants	monocots	Pontederiaceae	*Monochoria cyanea*			C		1/1
protists	green algae	Chlorophyceae	*Chara*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

ATTACHMENT 4

Protected fauna species, potential to occur in the resource area, assessment of likely impact and ameliorative measures

Scientific Name	Common Name	Status NCA EPBC	Habitat	Probability of Occurrence	Potential Impacts from Proposed Works.	Proposed Ameliorative Measures
Birds						
Accipiter novaehollandiae	Grey goshawk	Rare	Forests, including rainforests, of costal and near coastal southern, eastern and northern Australia. Appears to avoid open forest country, frequenting the heavier forests particularly in hilly and mountain country	Low	Key habitat not present	Key habitat not present
Ephippiorhynchus asiaticus	Black-necked Stork	R	Freshwater ponds, lagoons and lakes	Low	Key habitat not present	Key habitat not present
Erythrotriorchis radiatus	Red Goshawk	E V	Varied habitat including tall open forests, woodlands, lightly treed savannah and the edges of rainforest. Nests in trees taller than 20m within 1km of water. Nests measure approximately 100cm across, 30 to 50cm high and are an arrangement of large sticks (up to 200cm) with an untidy base and lower sides.	Low	The main potential threat is disturbance at the nest site, which may disturb breeding pairs and result in reduced reproductive success. .	Effective searches for nests in large trees. See Standard Conditions
Neochmia ruficauda ruficaida	Star Finch	E E	Tall grasses, grassy woodlands and riparian areas near permanent water or frequently inundated areas. Nest in patches of grasses or reeds, or low in trees, usually near water.	Low	Key habitat not present	Key habitat not present
Rostratula australis	Australian Painted Snipe	Rare V	The Australian Painted Snipe is usually found in shallow inland wetlands, either freshwater or brackish, that are either	Low	Key habitat not present	Key habitat not present

			permanently or temporarily full			
Mammals						
Hipposideros diadema reginae	Diadem leaf-nosed bat	R	This bat species is not restricted to rainforest and in outback Australia it forages within eucalypt woodland and open forest, deciduous vine thicket. During the day it roosts in small groups in caves, old mines and sheds, hollow trees and tree branches	Low- Moderate	The main potential impact is loss of tree hollows due to clearing for gravel pit establishment.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.
Hipposideros semoni	Semon's Leaf-Nosed Bat	E E	Roost in trees, caves, abandoned mines or rocky hangings. Forages in dense vegetation generally <2 m above forest floor. Rainforest, monsoon forest, dry open woodland. Suitable habitat along the alignment.	Low - Moderate	The main potential impact is loss of tree hollows due to clearing for gravel pit establishment.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.
Pteropus conspicillatus	Spectacled Flying-fox	V V	Camp sites found in mangroves, melaleuca woodland, eucalypt forest, tall acacia trees and rainforest. Seasonal use of melaleuca woodland during flowering period.	Low- Moderate.	The main potential impact is loss of habitat due to clearing for gravel pit establishment.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.
Rhinolophus philippinensis (large form)	Greater Large-eared Horseshoe Bat	E E	Roosts in caves and abandoned mines. Rainforest, dry open woodlands	Low - Moderate	The main potential impact is loss of habitat due to clearing for gravel pit establishment.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.

Dasyurus hallucatus	Northern Quoll	C E	The northern quoll lives in a range of open woodland and open forest types preferring rocky areas. Its greatest breeding success is known to occur at sites near water. They also inhabit eucalyptus forests that are no further than 150 kilometers from the coast. Vine forests and adjacent woodlands are most likely to support this species.	Low	A potential impact is loss of habitat due to clearing for gravel pit establishment.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.
Petrogale mareeba	Mareeba rock-wallaby	R	They are quite restricted in distribution, being found only in the Mareeba area, west of Cairns, north to Mt.Carbine and south to Mt. Garnet. They are found in rocky habitats, which tend to be granite boulders found in tropical open woodland.	Low	Key habitat not present	Key habitat not present
Macroderma gigas	Ghost bat	V	Ghost bats occur in a wide range of habitats from rainforest, monsoon and vine scrub, to open woodlands in arid areas. These habitats are used for foraging, while roost habitat is more specific. When foraging they use perches which are less than three metres above the ground, on small branches or the main trunk of eucalypts.	Low - Moderate	The main potential impact is loss of foraging sites.	Effective searches for hollows in large trees; minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.
Reptiles						
Acanthophis antarcticus	Common death Adder	R	The common death adder is found in a wide variety of habitats, in association with deep leaf litter. Habitats include rainforests, wet sclerophyll, woodland, grasslands, chenopod dominated shrublands and coastal heathlands.	Low (Deep leaf litter absent).	A potential impact is loss of habitat burrows and destruction of individuals.	Minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.

Egernia rugosa	Yakka skink	V	V	Rocky or lateritic substrates on slopes, with dry sclerophyll forest, open forest, woodland or shrub land	Low - Moderate	Potential impacts are loss of habitat, burrows and destruction of individuals.	Minimise vegetation disturbance; vigorous revegetation efforts; no clearing in rocky vineforest areas; see Standard Conditions.

ATTACHMENT 5

Gravel Pit Guideline –

Access, Investigation, Operation and Rehabilitation of Gravel Pits

Queensland Government

Department of Main Roads

GUIDELINE –

ACCESS, INVESTIGATION, OPERATION & REHABILITATION OF GRAVEL PITS

Prepared by	Paul Graham
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Contact for enquiries and proposed changes

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Version history

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Version 0.1	2005	Paul Graham	-	Amendment to original version
Version 0.2	Mar 2007	Paul Graham	Arthur Yates	Update of whole document based upon recent learnings.

Document sign off

The following officers have **approved** this document.

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1 SCOPE

This guideline details the basic requirements for access, investigation, construction and rehabilitation of gravel and borrow pits (now collectively referred to as gravel pits), where ridge gravels or off stream gravels (located outside the high banks of watercourses) are used for road works.

It is envisaged that this guideline will provide guidance for those persons involved with extractive operations and encourage effective rehabilitation of gravel pits within the Peninsula District. With minor modification it may also be suitable for use by other Main Roads Districts.

The methods employed in this guideline reflect a number of years of on-site experience with regard the management of gravel pits. They have been found effective in meeting the objectives of this guideline and add only a minor amount onto the overall cost of the extraction operation. Remedial costs to rehabilitate degraded pits far out way the cost to implement these best management practices.

1.1 OBJECTIVES

The objectives of the guideline are as follows:
Ensure that:

1. Material is fit for purpose – quality. This means that limited resources, such as high strength sealing gravels, are not inappropriately used for maintenance purposes.
2. Material is fit for purpose – quantity. The available resources shall be assessed against the environmental impact of obtaining them. This means that large areas of vegetation shall not be cleared to yield a small quantity of material.
3. Thorough planning occurs before operations commence.
4. Legal access to material is obtained through the landholder.
5. All necessary licenses and permits are obtained before operations commence.
6. Investigation and rehabilitation phases are an integral part of the operation.
7. Visual impact of operations on the surrounding vista is negligible.
8. Final post rehabilitation landform is left in a safe condition.

Promote:

9. Stability of the ground surface, using sound soil conservation practices.
10. Revegetation of the site and where practical, use native species.
11. Recovery of the landscape into a natural, self-sustaining ecosystem.

Note, this guideline:

- In no way reduces any obligation to obtain all necessary approvals and permits prior to commencing work.
- Should also be read in conjunction with the contract documents and where there is any inconsistency between the two, the contract documents shall take precedence.
- Provides details on materials investigations. It should be noted that material investigation surveys shall determine whether the gravel is fit for purpose (quality and quantity) before assessments (such as the Review of Environmental Factors [REF]) are undertaken and permits for excavation are obtained. This should minimise wasting resources on sites that are not fit for purpose.

2 NATIVE TITLE & CULTURAL HERITAGE OBLIGATIONS

Before undertaking material investigation surveys (MIS) and/or gravel extraction, Main Roads shall meet its Native Title and Cultural Heritage obligations. To initiate this process, the District's Cultural Heritage and Native Title Liaison Officer shall be contacted, advised of the proposed works and advice implemented.

2.1 NATIVE TITLE

To meet our Native Title obligations all projects shall be assessed against the Native Title Procedures. This is a complex process which depends on, but is not limited to, the following factors:

- Land tenure.
- Tenure history.
- ILUAs.
- Activity undertaken.
- State of the Native Title Claim (should there be one).

Thus, before undertaking a MIS and/or developing a gravel pit, a Native Title assessment shall be completed by the Project Coordinator, Design. Should there be any need for a notification, then a minimum 28 working day mandatory notification period shall apply.

This notification and lead time shall be factored into all works.

2.2 CULTURAL HERITAGE

Similar to the above, Main Roads is required to meet its 'duty of care' and ensure that the land-use activity is carried out lawfully in relation to the *Aboriginal Cultural Heritage Act 2003*.

Thus, prior to conducting a MIS or developing a gravel pit, a cultural heritage risk assessment shall be undertaken by the Cultural Heritage Unit. Depending on the result of this risk assessment, a cultural heritage survey with Traditional Owners may be required.

The assessment and lead time shall be factored into all works.

Therefore, before **any** invasive works are undertaken Native Title and Cultural Heritage issues shall be addressed. Should there be any concerns with either Native Title or Cultural Heritage the Project Manager shall contact the Main Roads' Cultural Heritage and Native Title Liaison Officer to discuss these concerns.

3 GRAVEL PITS – GENERAL

As management practices of road construction activities generally precludes the development of new pits within the coastal or the Wet Tropics World Heritage Area, this guideline essentially focuses on the western and northern regions of the Peninsula District, where the landscape typically consists of grassed open forests and woodlands, with shallow to negligible topsoil.

Under the context of this guideline, pits are described generally as shallow excavations down to bedrock, clay, unsuitable or unrippable material.

Construction material is typically won by clearing the land of trees and grass cover, stripping and stockpiling the topsoil and rilling the material by way of a bulldozer, grader or loader into windrows. The material is then removed from the windrow and placed into stockpiles or loaded onto trucks and transported to the job site. Scrapers are sometimes used if the pit is close to the job site.

Gravel pits are typically 500 - 800 mm deep. However, depending on the depth to bedrock and the rippability of the material, they may be up to 2.5 m deep. Where possible, pits should not be sited where gravel is less than 300mm deep, as shallow deposits necessitate the clearing of large areas of vegetation for little resource. Furthermore, contractors may be tempted to use some or all of the topsoil as construction material, to make up for the shortfall in available gravel material, especially if there is gravel within the top 150mm. This practice is not acceptable.

It cannot be stressed enough about the importance of topsoil and its preservation. In association with water, topsoil, or the top-most 150mm of material on the surface, is the most important component of a successful rehabilitation project. All topsoil (the upper layer of the soil profile that typically supports plant growth) shall be retained for rehabilitation.

Gravel is typically won from ridges. These slopes are generally gentle, but may be steep enough to cause erosion during high intensity rainfall events or when erosive soils are present. Thus erosion protection works are integral to the rehabilitation process.

The REF process will identify site-specific requirements for particular pits. Consultation should be undertaken with the property owner/lessee, and persons or organisations with an interest or expertise in site issues (i.e. NRW, DPI, EPA, Traditional Owners etc.) to resolve any matters that arise in the REF. These issues should then be included in the contract specifications and/or implemented by the Project Manager. The importance of consulting with the landholder cannot be stressed enough.

It is strongly recommended that pits are operated during the dry season and progressively rehabilitated. Then prior to the wet season, **all** outstanding rehabilitation is undertaken and the site seeded and fertilised to take advantage of the prolonged period of rainfall, local seed bank in the topsoil and, seeding from adjacent vegetation during storm events.

Successful rehabilitation of a pit means that MR meets its legal obligations and the objectives of this guideline.

4 NOTICE OF ENTRY

MR, prior to entering lands and conducting operations, **shall** seek the permission of the landholder using a Notice of Entry (NoE) form. The department has a standard 'Notice of Entry' form - M727. Note that Sections 35, 36 and 37 of the *Transport Infrastructure Act* (1994) outline the process for entering upon lands.

More specifically, the purpose of the NoE is to seek the permission of the landholder for MR officers or agents to enter onto the land mentioned in the NoE. The NoE also serves to give the landholder advance notice that MR wishes to enter onto the landholder's property.

While the minimum notice that must be given to the landholder is three (3) days, MR endeavors to give as much notice as practicable, so that various matters may be addressed.

MR may enter onto the landholder's property either upon obtaining written permission or after three (3) days following the landholder receiving the NoE. The preferred method of entry is with the landholder's written permission. To assist in this matter, the landholder should complete the approval section of the NoE.

MR staff and their agents should be aware that once MR has entered, occupied or used the land they are liable to pay compensation for physical damage, should the landholder make a claim for compensation.

5 MATERIAL INVESTIGATION SURVEYS

Material investigation surveys (now referred to as MIS) are an integral part of the gravel pit process. They shall be undertaken in accordance with the requirements outlined within this guideline.

One of the main purposes of a MIS is to ensure that the material is fit for purpose for both quality and quantity. This will help to ensure that resources are used appropriately. That is, high strength sealing gravels are not inappropriately used for maintenance purposes (and visa versa). Also, the available resources shall be assessed against the environmental impact of obtaining them. This means that large areas of vegetation shall not be cleared to yield a small quantity of material.

MR Staff need to be aware that an REF, assessing the site's environmental values and constraints, has not been undertaken at this stage of the works. A REF for the gravel pit is only undertaken if the MIS delineates a viable resource or suitable site that is 'fit for purpose'.

Due to this sequencing of events, the MIS section of the guideline functions as 'bridging' requirements, prior to works being carried out under a contract with REF requirements and in accordance with the guideline.

The principle of the MIS section is that investigation works are of a 'low key nature' and as such, minimisation of disturbance, mitigation of environmental damage and subsequent minimisation of rehabilitation costs are the key objectives of this section.

A MIS may be undertaken in sensitive areas which may contain protected vegetation. Furthermore, there is also a high potential that earthworks at these sites may damage or destabilise the site. Therefore, it is important that all works are undertaken in a sensitive manner that avoids any unnecessary disturbance.

To eliminate any misunderstanding about the extent of disturbance, no clearing or earthworks shall be carried out without the person responsible for managing the MIS being present.

Staff undertaking the MIS should be aware that not all surveys historically have had positive outcomes. Thus, it is important that any works carried out to facilitate the investigation are as low impact as possible.

When planning access track locations and constructing access tracks the following shall be considered and implemented:

- Select the smallest piece of machinery that can undertake the works.
- Locate the access track to minimise clearing.
- Locate the track away from water bodies including water courses, springs and ephemeral areas. When undertaking crossings, access to stream beds must be carefully planned so as not to destabilise the banks or bed.
- Locate the track along the contour rather than traversing sloping terrain. In some situations it may be more prudent to increase vegetation clearing and have a slightly longer access track, than to traverse steeply sloping ground and potentially cause erosion.

- No clearing or earthworks shall be carried out without the MR project officer responsible for managing the MIS being present (to eliminate any misunderstanding about the extent of permissible disturbance).
- Retain ground cover over access track.
- Limit clearing for track construction, as the exposed ground may be susceptible to and cause erosion problems and increased rehabilitation costs.
- Protect listed species and, of concern and/or endangered regional ecosystems by flagging off species/areas with flagging tape.
- Flag the permissible limits of the access track and the area to be cleared.
- Only one access track to the pit shall be constructed, except where safety or machinery requirements necessitate separate entry and exit tracks.
- Re-spread ground cover and cleared vegetation over the disturbed ground.
- Retain plant root systems where possible to help improve ground stability.

When undertaking the sampling or constructing machinery pads the following shall be considered and implemented:

- Limit clearing for earthworks, as the exposed ground may be susceptible to and cause erosion problems and increased rehabilitation costs.
- Peg the sampling grid location and each test hole before any clearing takes place.
- Flag the permissible limits of the area to be cleared.
- Stockpiles shall not be located outside the limits of disturbance.
- No soil shall be stockpiled against or under vegetation to be retained.
- Excavated material shall be stockpiled away from drainage paths and within the limits of disturbance.
- Stockpile topsoil separately for use when backfilling the excavation.
- Replace the material removed in the opposite order to that which it was removed, with the final layer being the topsoil.
- Compact the material by a number of passes with the backhoe (or relevant piece of machinery). Where possible, the compaction shall occur before the placement of the topsoil to help minimise damage to the topsoil.
- Shape pads to avoid concentration of run-off and consequential erosion problems.

When tidying up the stockpile area, care shall be taken not to disturb ground cover. All disturbed vegetation should be respread over the sampled area.

Clearing and earthworks between test holes shall be undertaken in accordance with the requirements for access tracks

6 ESSENTIAL ELEMENTS OF PIT CONSTRUCTION

The following elements shall be considered in the construction of new gravel pits or the extension of existing pits.

6.1 PERMITS, LICENCES, AUTHORITIES

The MR project officer responsible for extractive operations shall ensure that the following documents form part of the contract scheme package or at a minimum, are reviewed and implemented, prior to commencing operations:

1. Review of Environmental Factors (REF); and
2. Cultural Heritage assessment.

The contractor shall, prior to commencing operations, hold the following permits and licenses.

1. On leasehold land – a Quarry licence / sales permit issued under the Forestry Act. Forestry Officers will also advise of actions to be taken when millable timber is present.
2. On freehold land – permit to clear native vegetation issued under the Vegetation Management Act.
3. Development Approval and Registration Certificate issued under the Environmental Protection Act (e.g. for ERAs 20 & 22 to extract, crush & screen)
4. Clearing permit for listed species (should they be present) issued under either the Nature Conservation Act or the Environmental Protection Biodiversity Conservation Act.
5. Permit to burn (should the windrowed timber be burnt) – Queensland Fire Service
6. Notice of Entry Form (M727) when going onto private property.

Note:

- Prior to undertaking these operations, the Contractor shall contact the MR or RoadTek Environmental Officer and Project Manager to ensure that all necessary access arrangements, permits, licences and authorities have been obtained – permits other than those listed above may be required.
- Copies of the REF, Cultural Heritage assessment, permits and licences should be held on site or at the works site office.
- Should marketable timber be present the landholders shall be consulted prior to clearing. Marketable timber may be harvested prior to or during clearing operations. Within leasehold land, clearances and permits are required from DPI (Forestry Operations). Should the pit be located within the road reserve, MR is deemed to own the timber and it may be disposed of as the Principal deems appropriate. It is generally good practice to give the timber to a local community group or school.
- Permits / licences can take up to 3 months to obtain; thus planning should account for these delays.
- The permit / licence conditions shall be set out in the contract specifications and Project Managers shall be aware of the conditions.

6.2 REF Conditions / Constraints

The Principal is responsible for carrying out the REF. The REF identifies the projects' environmental values, impacts and constraints and, recommends options to minimise these impacts. This process is undertaken by assessing:

- Relevant databases;
- Geomorphic attributes, regional ecosystems, common and listed species and weed species;
- Legislative requirements;
- Constraints and impacts; and
- Making recommendations as to appropriate courses of action to mitigate any impacts that the works may cause.

Due to the lead time to obtain licenses / permits, the Principal should, where possible, obtain the appropriate licences / permits to better manage potential delays during the construction phase.

It is stressed that where possible, gravel pits should avoid 'of concern' or 'endangered regional ecosystems' and, species listed under state and federal legislation.

6.3 Landowner / leaseholder Agreement of Conditions

The Principal's Representative and the Contractor should meet with the landholder and discuss use of the site. Issues for discussion include:

1. Access to the pit;
2. Dimensions of the pit and buffer zones;
3. Vegetation management;
4. Final pit landform (e.g. turning the pit into a dam);
5. Management of millable timber; and
6. Revegetation (i.e. what species are to be used in revegetation of the pit)

Any agreed site-specific requirements, determined through consultation with the landholder, should be put in the contract or at least, in writing and signed by the landholder. Site-specific requirements may override some conditions outlined in this guideline. A Notice of Entry Form (M727) shall be completed.

6.4 Weed management

Environmental Officer Responsibilities

The identification of any declared or high priority weeds should be included as a minimum output requirement within the REF. Should declared weeds be present, their management shall be included in the contract specifications.

Contractor Responsibilities

The Contractor shall ensure that no new weeds are introduced to the site. Furthermore, as part of a program to control weeds, prevention measures shall be implemented to prevent weed spread either within the pit, along the road corridor or, to the adjoining properties.

Weed control measures may include, but not be limited to the following:

1. Utilising the Local Government Authorities (LGAs) or specialist contractors within the Peninsula District to control the weeds;
2. Spraying / burying / burning the existing weed infestation before works begin;

3. All machinery (such as trucks, dozers, loaders, graders etc.) shall be thoroughly washed prior to leaving the depot;
4. In high-risk areas, where declared or significant environmental weeds are present, all machinery shall be thoroughly washed down prior to leaving the work site; and
5. In low risk works areas, machinery (such as dozers, trucks, loaders, graders etc.) shall be thoroughly washed prior to leaving the project area (say an area of intermittent resheeting over 50 km).

6.5 Soil Management

Soil types that may occur in association with gravel deposits vary across the western and northern regions of the Peninsula District. They can roughly be grouped into the following soil groups, which are listed in order of the most commonly occurring to the least commonly occurring in surface area:

1. Sandy or loamy gradational soils;
2. Uniform sands and sandy loams and uniform loams and clay loams – (shallow gravelly soils); and
3. Textured contract soils (non-dispersive and dispersive and, non-sodic and sodic).

It is important to understand that the soil groups which may occur in association with gravel deposits could be rated as high risk soils. That is, they have characteristics which cause them to be erodible either due to their physical properties, such as lack of cohesion (sandy gradational soils) and / or chemical properties, such as sodicity (textured contract soils – dispersive).

Other important parameters that influence a soil's erodibility include:

- vegetation - extent and type of ground cover;
- topography - slope gradient and length; and
- climate - rainfall erosivity.

The combined assessment of these parameters determine the erosion risk rating of the soil and direct those persons involved with extractive operations towards better management practices during survey, extraction and rehabilitation operations.

On a site specific basis, the REF should include an assessment of the erodibility of the soils and recommendations of suitable stabilisation techniques. This assessment (which includes laboratory tests) will allow for the amelioration (treatment) of soils to improve the following high risk soil characteristics:

- dispersion;
- sodicity;
- low pH;
- imbalances in soil exchangeable cation distribution; and
- salinity.

Typical amelioration treatments include the incorporation of agricultural lime (not hydrated or quicklime), dolomite and / or gypsum into the soil profile.

Sound soil management practices and successfully established vegetation cover are considered the most effective and sustainable means of stabilising soils.

6.6 Planning progressive rehabilitation

Rehabilitation of all disturbed areas shall be undertaken before the start of the wet season (e.g. November). Rehabilitation shall not be left until the end of the works. All works shall be planned to enable this to occur.

Particular attention should be given to ensure that machinery is available for rehabilitation earthworks (eg. pit reshaping and tyning) and, seed and fertiliser are available for revegetation works. Should the pit have been reshaped before September, the seed bed shall be prepared again, prior to seeding and fertilising by tyning the topsoil.

Care should be taken in areas where subsoils are unsuitable for plant growth to avoid mixing the subsoil into the topsoil.

Furthermore, the Contractor should be aware that seed, both native and pastoral, needs a lead time for procurement. Thus, purchasing of seed should not be left until the last minute.

7 PIT MANAGEMENT

7.1 Introduction

The Contractor shall prepare an appropriate Access, Investigation, Operation and Rehabilitation Plan showing the location of the pit relative to drainage lines, natural topography, roads, and other relevant features. This plan shall also detail how progressive rehabilitation will be implemented. Examples of typical site plans are shown in Appendix A. As a minimum output the Contractor shall, in writing, commit to the Principal that this guideline shall be implemented in full. The Project Manager shall also have a copy of the REF on-site and implement any mitigation measures proposed in the document.

The following physical characteristics shall be considered when planning the excavation and rehabilitation of a gravel pit.

(a) Access;
(b) Pit location, orientation and size requirements;
(c) Vegetation retention;
(d) Clearing and windrowing of vegetation;
(e) Stockpiling overburden and topsoil;
(f) Operation;
(g) Profiling;
(h) Drainage
(i) Ripping worked out areas;
(j) Spreading overburden, topsoil and vegetation; and
(k) Rehabilitation of access tracks.

7.2 Access

Access tracks shall be chosen to minimise clearing and ground cover shall be retained where possible, as the exposed ground may be susceptible to and cause erosion problems and increased rehabilitation costs. Root stock shall be retained where possible to help improve ground stability.

Flagging tape shall be used to mark out the access track. Access to the pit should be via a single access track, except where safety or machine requirements necessitate separate entry and exit tracks.

When constructing access tracks avoid crossings of watercourses. Should crossings have to be constructed they should be carefully planned so as not to destabilise the bed or banks.

Access tracks should, where possible, be constructed along the contour rather than traversing sloping terrain. However, in some situations it may be more prudent to increase vegetation clearing and have a slightly longer access track, than to traverse steeply sloping ground and potentially cause erosion.

7.3 Pit Location, Orientation and Size Requirements

Pits shall be orientated to minimise runoff velocities on the proposed disturbed areas and therefore minimise the potential for erosion, both on and off-site. Accordingly, where practical, the longest axis of the pit shall be orientated parallel to the contours of the natural topography.

Pits shall be sited to avoid impact on highly erosive soils, protected flora, protected regional ecosystems, habitat trees and cultural heritage sites.

Listed species and/or ecosystems shall only be disturbed if consent has been obtained from the relevant government agency.

Pits should be located away from natural drainage paths / watercourses to reduce the likelihood of the pits filling with water from the flooded drainage path during the wet season and, to reduce the potential for sediment discharge from site into adjacent watercourses. Down-slope impacts shall be fully considered when locating pits.

The maximum disturbed area of each pit (including vegetation, overburden and topsoil stockpiles) shall be flagged and shall not exceed 150m long x 100m wide unless approved by the Principal (after consultation with the District Environmental Officer). Disturbances should be minimised as much as possible.

Clearing for gravel pits shall not occur within:-

1. 200m of each high bank of each stream with a stream order of 5 and above.
2. 100m of each high bank of each stream with a stream order of 3 or 4.
3. 50m of each high bank of each stream with a stream order of 1 or 2.

A diagram of stream order is attached as Appendix B. As an example, stream order 1 is the first gully (a small gully located at the head of a catchment) shown on a 1:250,000 topographic map.

General points to consider:

- The access track to a pit should be constructed to suit the expected usage.
- Cross drainage may be required to minimise adverse effects to the pit and the access track if they are located on moderate to steep slopes, erosive soils are present and/or the pit is operated during the wet season or for longer than one year.
- To minimise disturbance, only one access track off the state controlled road shall be constructed.
- Where possible, the pit should have a buffer zone between the road and the pit to minimise the visual impact of the pit and to deter the public from accessing the area. The width of this buffer zone should be commensurate with the type of forest present; the more open the forest community, the wider the buffer. Conversely, the more thickly forested the site, the narrower the buffer. Buffers should be at least 50m wide; preferably in excess of 100m.

A general pit layout is shown in Appendix A. Where practical, the typical pit layout should be applied in a grid pattern across the site.

7.4 Vegetation Retention

Unless otherwise specified, each pit excavation shall be separated from the next pit excavation by an undisturbed vegetation buffer. The buffer width, where possible, should equal the disturbed width of the pits (including vegetation, overburden and topsoil stockpiles). For example, if the disturbed width of the pits is 50m the buffer width should be 50m; if the disturbed width of the pits is 75m the buffer width should be 75m. The buffer shall extend on all sides of the pit. The buffer areas may then provide an economical resource for future extraction.
The functions of the buffer are to:

- slow water velocity and hence reduce the erosion potential;
- operate as a flora / fauna habitat and corridor; and
- provide a seed source for natural revegetation of disturbed areas.

In the event that an equal width cannot be achieved (e.g. due to irregular pit shape or the presence of pre-existing pits), a buffer width of at least 30m shall be employed. This reduction in buffer width is to be approved by the Principal (after consultation with the District Environmental Officer).

Once the gravel has been extracted, the entire site rehabilitated and provided regeneration of the former pit areas have been achieved to the satisfaction of the Principal (after consultation with the District Environmental Officer), gravel may be removed from the buffer areas.

7.5 Clearing and Windrowing Vegetation

Following assessment of the orientation and buffer and, after the pit area and areas to be avoided have been flagged, vegetation clearing can commence. When clearing, minimal disturbance of topsoil is to take place. This is to prevent the topsoil being mixed with the felled timber. After clearing, localised grubbing of roots may occur.

Vegetation shall be stacked in windrows 5 to 10m wide at the edge of the pit. Topsoil should not be pushed up with the timber as it is required for revegetation works. Cleared vegetation shall not be burnt unless approval from the landholder and local Fire Warden have been obtained (a copy of the permit and letter from the landholder shall be retained). All conditions imposed as part of this approval shall be complied with. Generally, burning of vegetation will be undertaken in the centre of the pit and at a time when the risk of the fire getting out of control is low. The other option is to arrange for the landholder to burn the timber.

7.6 Stockpiling Overburden and Topsoil

All topsoil shall be stockpiled in a designated area for reuse. Where the topsoil depth is negligible, the top 150mm of soil shall be stockpiled.

Care should be taken not to contaminate this topsoil layer with underlying subsoil layers, particularly where the site is located in dispersive texture contrast soils. Care should also be taken to avoid stockpiling bedrock with the topsoil.

It is generally accepted that the top 50mm to 100mm of soil contains the seed, vegetative matter, nutrient reserves and soil microbes (small bugs) suitable to promote regeneration of local natural grasses and trees. However, 150mm is required to give the dozer operator enough material to work with so as to cover the entire pit floor during the rehabilitation process.

Topsoil should be stockpiled loosely and compaction must be avoided. Topsoil stockpiles shall be constructed to not more than 1.5m high and at an angle of repose (the angle that it will stand naturally). High and/or compacted topsoil stockpiles tend to damage the seed, microbes and vegetative matter within the centre of the stockpile, thus reducing the viability of the material. Compaction can also occur through needlessly driving vehicles over the stockpiles.

Should overburden (reject material that is found under the topsoil and unsuitable for use in road construction) be present, it shall be stockpiled separately from the topsoil. Similarly, should dispersive/sodic material be present, it shall also be stockpiled separately.

In association with the activity of stockpiling topsoil and overburden, stockpiles should not be located in an area of concentrated water flow and, upslope waters should be diverted around the pit and topsoil stockpiles. This can largely be achieved by ensuring that the timber stockpiles surround these areas on all sides. These protection measures will minimise the loss of topsoil during rainfall events and help prevent sediment-laden waters from being washed off-site into adjacent waterways.

Should potential exist for the sediment from the topsoil or overburden to be washed into a watercourse, a silt fence or other suitable device shall be erected around the stockpile to prevent this from happening.

7.7 Operation

Typical Site Plans 1 and 2 (Appendix A) illustrate options as to how operations can be undertaken.

Should all the windrowed gravel not be used during the current season's works and/or should material be required over the wet season for maintenance, the gravel shall be stockpiled at the front of the pit, near the access. This will make it easy to obtain the gravel when conditions may be boggy and will encourage earthmoving machinery and trucks etc not to drive over the freshly rehabilitated area.

Pits should be progressively rehabilitated.

7.8 Profiling

Following the extraction operation, the pit floor shall be profiled, where possible, to drain the pit area. Where possible, to minimise erosion potential, drainage paths / lines should not exceed 2%. Should drainage lines be in excess of 2%, soil conservation measures (e.g. rock mulching, rock check dams etc.) must be employed to slow the water velocity.

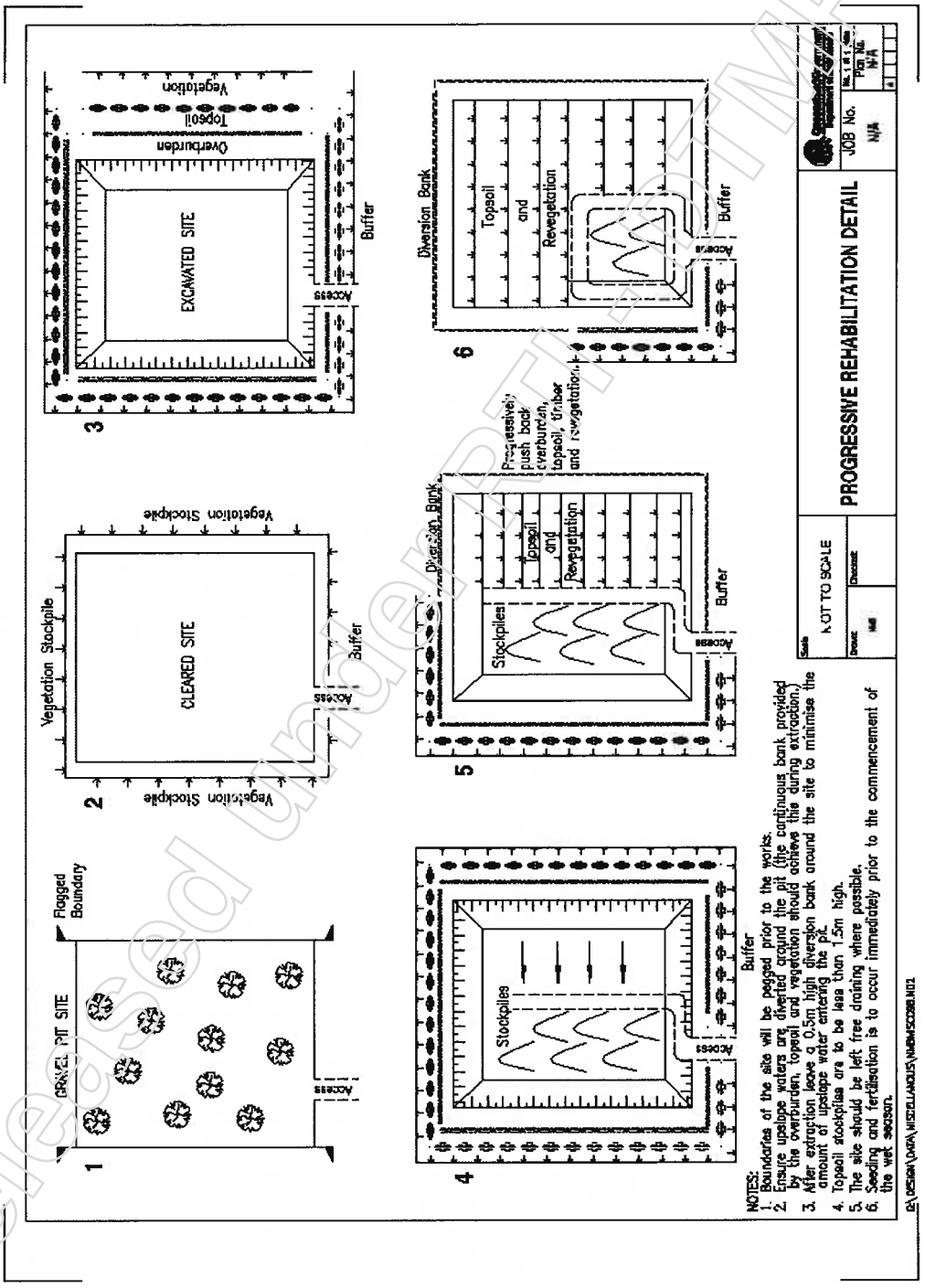
Where the pit is self draining, the main drainage paths within the pit area shall be constructed with flat bases that are a minimum of 2.5m wide, to promote sheet flow of water along the drainage path. Short drainage paths are preferable. For example, where contours and conditions allow, the pit shall be profiled so as to drain transversely to the centre of the pit and from the centre of the pit, longitudinally toward each end (see diagram – Appendix A).

In many cases, it will be impossible to drain the pit (for instance - the pit is located in a flat area). In these situations, where the pit may hold water over the wet season, the bottom of the pits shall be shaped to drain to one corner or side, to function as a sump. This will assist in minimising seed loss of water logging intolerant seed should the pit fill and retain water for an extended period. These sumps should be approximately 1m – 2m deeper than the surrounding pit floor. To prevent cattle bogging in the sump when watering, gravel should be compacted onto the batters and base of the sump.

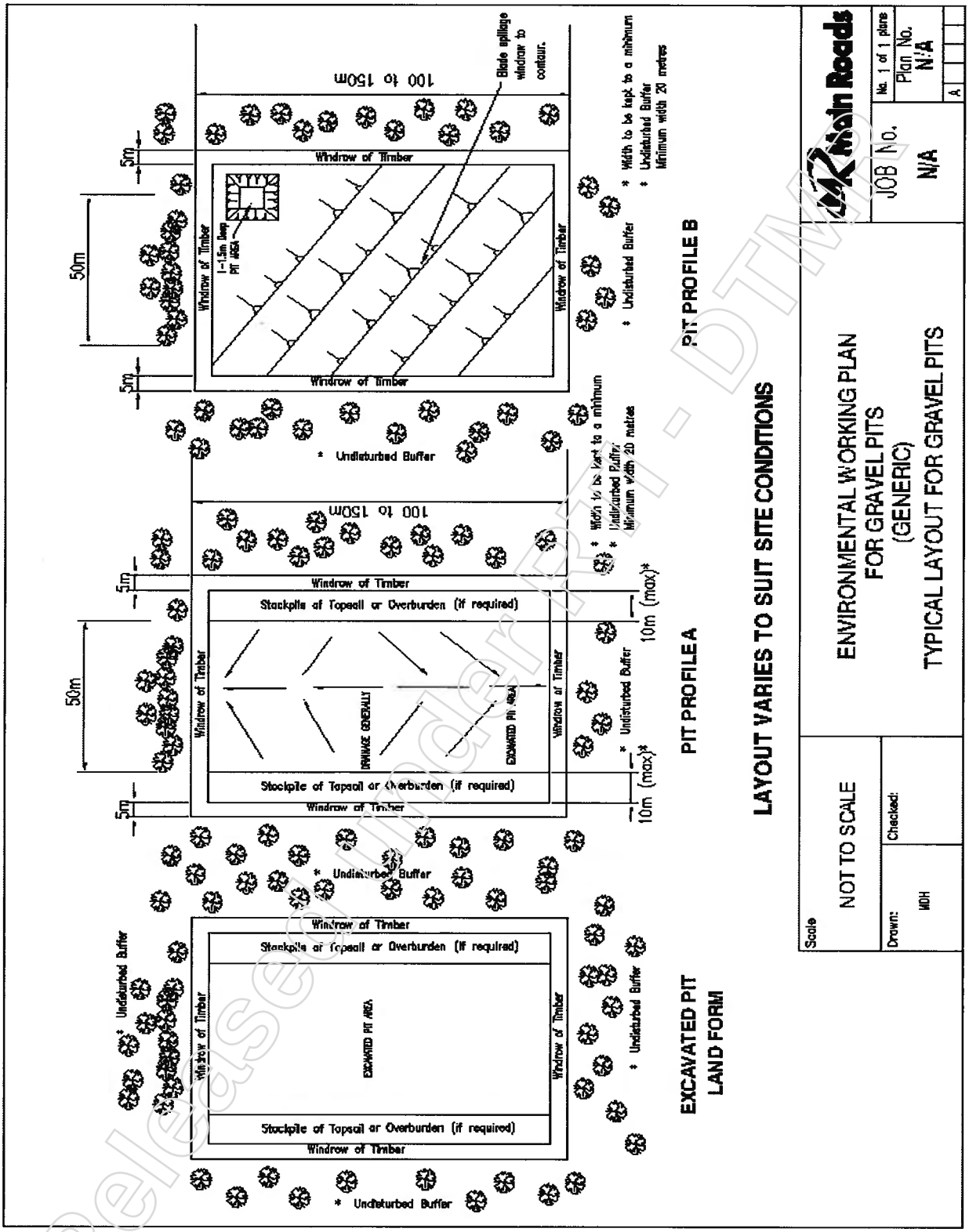
the occurrence of declared weeds. Photographs should be taken at each monitoring visit and where possible, these visits could be undertaken with the property owner.

Remediation works should be arranged where regeneration is unsuccessful or where there is evidence of gully erosion or declared/significant weeds.

APPENDIX A - TYPICAL SITE PLANS



Progressive Rehabilitation Plan – detailing how the contractor will ensure that progressive rehabilitation will be implemented on-ground



Typical Pit Layout – detailing the pit drainage.

APPENDIX B - STREAM ORDER

Stream order is a numerical ordering classification of each segment according to its position within a catchment, as shown on the attached diagram. As an example, stream order 1 is the first gully (at the head of a catchment) shown on a topographic map; while stream order 5 may be located well away from the mountains near the coast. When two streams of the same order join, the resulting watercourse becomes one stream order larger. If two streams of different order join, the resulting stream order is that of the larger stream. Stream order is generally taken from the available topographically mapping. On Cape York, it is the 1:250,000 topographic map.

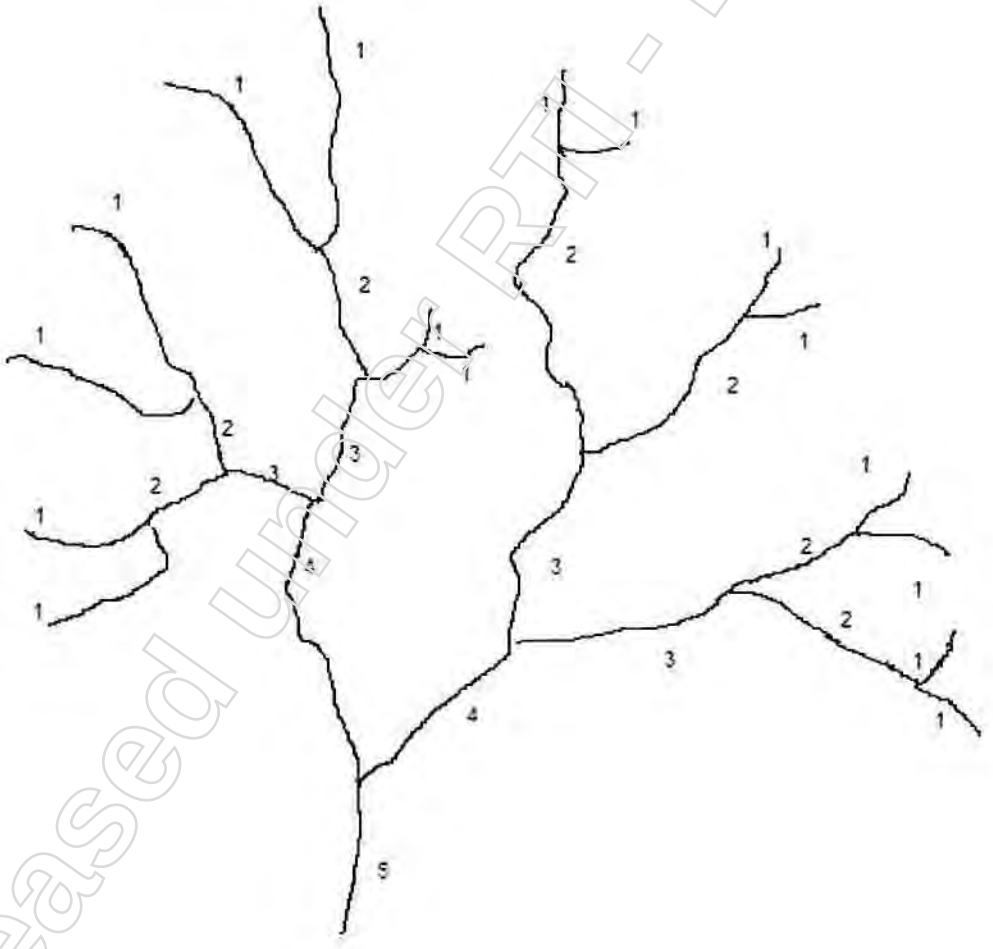


Diagram of Stream Order

ATTACHMENT 6

Main Roads Itinerant Licence

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

South-West District Office (Toowoomba)
PO Box 731 TOOWOOMBA QLD 4350
Phone: (07) 4639 4599 Fax: (07) 4638 4524
www.env.qld.gov.au ABN: 87221158786

Notice of decision to grant application for transfer of a licence (without development approval)

Section 127 *Environmental Protection Act 1994*

This statutory notice is issued by the administering authority pursuant to section 127 of the Environmental Protection Act 1994, to advise you of a decision or action.

Enquiries to : Rob Spalding
Telephone : (07) 4639 4599
Your reference : WT0351
Our reference : TWB1065

Queensland Department of Main Roads - Roadtek
Floor 6, 295 Ann Street
Brisbane Qld 4000

Attention: Mr M Chilton,

Re: Application for transfer of a licence (without development approval) by Queensland Department of Main Roads - Roadtek to carry out Environmentally Relevant Activity (ERA)
11(a) Crude oil or petroleum product storing in tanks or containers having a combined total storage capacity of 10 000 L or more but less than 500 000 L,
19(a) Dredging material using plant or equipment having a design capacity of not more than 5 000 t a year,
20(c) Extracting rock or other material from a pit or quarry using plant or equipment having a design capacity of 100 000 t or more a year,
22 (c) Screening etc materials by using plant or equipment having a design capacity of 100 000 t or more a year
62 Concrete batching - producing concrete or concrete products in works (including mobile works) having a design production capacity of more than 100 t a year
on an itinerant basis throughout Queensland.

Your application to transfer licence number WT0351, received by this office on 14 April 2003 has been granted.

A copy of Licence No.WT0566 which includes the schedule of conditions, is attached.

The transfer takes effect from 21 May 2003.

NR

21-05-03
Date

Sarah Fenaughty
District Manager (South West)
Southern Region
Delegate of Administering Authority
Environmental Protection Act 1994

ENVIRONMENTAL PROTECTION ACT 1994

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

South-West District Office (Toowoomba)
PO Box 731 TOOWOOMBA QLD 4350
Phone: (07) 4639 4599 Fax: (07) 4639 4524
www.env.qld.gov.au A3N: 87221158786

Integrated Authority No. WT0566

Section 311 *Environmental Protection Act 1994*

This integrated authority, issued in accordance with section 311 of the Environmental Protection Act 1994 (the EP Act), provides for the carrying out of different Environmentally Relevant Activities or Environmentally Relevant Activities at different places managed in an integrated way. This integrated authority comprises one or more type of environmental authority in accordance with sections 86, 53, 95, 104, 113 and 311, of the EP Act, and this integrated authority details the conditions that are relevant to each stated type of environmental authority.

Under the provisions of the *Environmental Protection Act 1994* this integrated authority is issued to:

Queensland Department of Main Roads - Roadtek
Floor 6, 295 Ann Street
BRISBANE QLD 4000

In respect of carrying out the Environmentally Relevant Activities (ERAs) at the same place and under the type of environmental authority described in the following parts.

This integrated authority is subject to the conditions set out in the attached schedules for each part.
The anniversary date of this integrated authority is 21 May each year.
This integrated authority takes effect from 21 May 2003.

NR
Signed

21 May 2003
Date

Sarah Fenaughty
District Manager (South West)
Southern Region
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This document is not proof of the current status of the authority. The current status of the authority may be ascertained by contacting the Environmental Protection Agency.

THIS INTEGRATED AUTHORITY CONSISTS OF THE FOLLOWING PART(S):

Each part consists of conditions relevant to various issues.

Licence Without Development Approval (Section 93) Part

11(a) Crude oil or petroleum product storing - Storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 10 000 or more but less than 500 000 l

19(a) Dredging material - Dredging material from the bed of any waters (other than dredging by a port authority of material for which a royalty or similar charge is not payable) using plant or equipment having a design capacity of not more than 5 000 t per year

20(c) Extracting rock or other material - Extracting rock (other than rock mined in block or slab form for building purposes), sand (other than foundry sand), clay (other than clay used for its ceramic properties, kaolin or bentonite), gravel, loam or other material (other than gravel, loam or other material under a mining authority) from a pit or quarry using plant or equipment having a design capacity of 100 000 t or more per year

22(c) Screening etc. materials - Screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth (other than under a mining authority) or by dredging using plant or equipment having a design capacity of more than 100 000 t or more per year

62 Concrete batching - Producing concrete or a concrete product by mixing cement, sand, rock, aggregate or other similar materials in works (including mobile works) having a design production capacity of more than 100 t per year

at premises / place described as:

located at:

On an itinerant basis throughout Queensland

The aforementioned description of the ERA(s) for which this authority is issued is simply a restatement of the ERA(s) as prescribed in the legislation at the time of issuing the authority. Where there is any conflict between the above description of the ERA(s) for which this authority is issued and the conditions as specified in this authority as to the scale, intensity or manner of carrying out of the ERA(s) then such conditions prevail to the extent of the inconsistency.

The authority is issued subject to conditions as set out in the schedule(s) attached that form part of the integrated authority.

Licence Without Development Approval (Section 93) Part

This part is for the carrying out of a level 1 environmentally relevant activity without a development approval, under chapter 4, part 3, division 2, subdivision 1 of the Environmental Protection Act 1994.

This environmental authority consists of the following schedules:-

SCHEDULE A - GENERAL CONDITIONS

SCHEDULE B - AIR

SCHEDULE C - WATER

SCHEDULE D - STORMWATER MANAGEMENT

SCHEDULE F - NOISE

SCHEDULE G - WASTE MANAGEMENT

SCHEDULE H - MONITORING AND REPORTING

SCHEDULE I - DEFINITIONS

SCHEDULE A – GENERAL CONDITIONS

Display of Environmental Authority

(A1) A copy of this environmental authority must be kept in a location readily accessible to personnel carrying out the activity.

Records

(A2) Any record or document required to be kept by a condition of this environmental authority must be kept at the Regional or Branch office for a period of at least five years and be available for examination by an authorised person.

Alterations

(A3) No change, replacement or operation of any plant or equipment is permitted if the change, replacement or operation of the plant or equipment increases, or is likely to substantially increase, the risk of environmental harm above that expressly provided by this environmental authority.

An example of a substantial increase in the risk of environmental harm is an increase of 10% or more in the quantity of the contaminant to be released into the environment.

Integrated Environmental Management System (IEMS)

(A4) The holder of this environmental authority must have due regard to the Integrated Environmental Management System which was submitted on 7 October 1998.

(A5) A copy of the Integrated Environmental Management System must be kept in a location readily accessible to personnel carrying out the activity.

Dredging

(A6) Any temporary or permanent storage of excavated material must be above the expected flood level.

(A7) Sand, gravel, clay or rock bars or riffle areas that create natural pools in the bed of the watercourse must not be lowered or disturbed outside of the works area.

(A8) All steps must be taken during dredging and associated operations to minimise erosion of the bed or banks of any watercourse or damage to vegetation growing in or on the bed or banks of such watercourse outside the authorised works area.

Site Stabilisation

(A9) The holder of this Environmental Authority must ensure all reasonable and practicable measures are taken to stabilise the site if the dredging site is to be unattended for a period of greater than 16 hours, after commencement of works but prior to the removal of all sediment and erosion control devices.

Rehabilitation

(A10) The holder of this environmental authority must restore or stabilise the site progressively following cessation of the environmentally relevant activity.

(A11) Soil erosion measures must remain in place until full grass or appropriate vegetation cover is achieved over disturbed areas and open ground.

End of conditions for Schedule A

SCHEDULE B – AIR

(B1) At each site where it could be expected that dust associated with licensed activities will cause environmental nuisance, reasonable and practicable in the circumstances methods are to be used to control it.

End of Conditions for Schedule B

SCHEDULE C - WATER
(relates to dredging operation only)

Quality Characteristics of Release of Contaminants to Waters

(C1) The environmentally relevant activity must be carried out in such a manner that any release of contaminants caused by dredging activity must:

(i) be minimised to the greatest practicable extent; and
(ii) not produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum or litter.

(C2) Dredging of material and any placement of spoil must be carried out in a manner such that all limits for all quality characteristics listed in Table 1 of Schedule C are complied with at any downstream point.

Table 1: Quality Characteristics of Releases of Contaminants to Waters

QUALITY CHARACTERISTIC	LIMIT AT ANY DOWN-STREAM POINT
Suspended Solids	33rd percentile - Must not exceed 10 percent greater than a background value. 66th percentile - Must not exceed 30 percent greater than a background value.
Turbidity (NTU)	33rd percentile - Must not exceed 10 percent greater than a background value. 66th percentile - Must not exceed 30 percent greater than a background value.
pH	In cases where the measured background value of pH value is less than 6.5 or more than 9.0, the pH value must not be less than 0.2 pH below nor more than 0.2 pH units above measured background pH value. In cases where the measured background value of pH value is not less than 6.5 or not more than 9.0, the pH value must be not less than 6.5 and not more than 9.0.
Dissolved Oxygen	Dissolved Oxygen, measured in milligrams per litre, must be 6 milligrams per litre or equal to the "background" level, whichever is least.

For the purposes of determining compliance with 33rd percentile measurements for condition (C2), not more than four (4) of the measured values of the quality characteristic are to exceed the stated release limit for any six (6) consecutive samples for a sampling point at any time during the licensed works.

For the purposes of determining compliance with 66th percentile measurements for condition (C2), not more than two (2) of the measured values of the quality characteristic is to exceed the stated release limit for any six (6) consecutive samples for a sampling point at any time during the licensed works.

For the purposes of determining compliance with condition (C2), a background value is the value obtained for a water quality characteristic at a sampling point located in the receiving waters at a background location unaffected by the dredging activity.

For the purposes of determining compliance with condition (C2), a downstream point refers to any sampling point in the receiving waters situated not more than 50 metres downstream of the dredging activity.

Minimisation of Sediment Releases to Waters

(C3) Sediment control devices (eg. silt curtains, straw bales, silt fences and check dams) must be installed where appropriate to minimise the concentration of suspended solids to any waters.

Release of Petroleum Products

(C4) There must be no deliberate release of petroleum products from any dredging equipment or petroleum product storage facility to any waters.

(C5) Refuelling of equipment associated with the dredging operation must not occur within the bed or banks of any watercourse or drainage lines.

Disposal of De-silting Spoil

(C6) The licensee must take reasonable and practicable measures to ensure that de-silting spoil is disposed of in a location and in a manner which keeps to a practical minimum the risk of it being eroded and carried by wind or rainwater or other natural means into waters.

End of Conditions for Schedule C

SCHEDULE D – STORMWATER MANAGEMENT

(D1) Contamination of stormwater runoff must be controlled by methods that are reasonable and practicable in the circumstances, such as the following—

(a) providing appropriate works such as bunding or drains around the site of the activity, designed to intercept stormwater runoff coming from areas outside the site and divert it away from the site;

(b) storing materials liable to contaminate stormwater runoff within the site, such as petroleum products and chemicals, under cover or within a bunded compound, and on a floor which is practically impervious to the materials in the event of any spill;

(c) ensuring that above-ground tanks used for storing liquid petroleum products are enclosed by a bunded compound having a capacity not less than 110% of the volume of the tanks it encloses;

(d) providing settling ponds to reduce sediment concentration in stormwater runoff within the site before its release off the site, so that the quality of stormwater thus released to a watercourse is not worse than the quality of waters in the watercourse immediately upstream of the place where the stormwater enters the watercourse.

End of conditions for Schedule D

SCHEDULE F – NOISE

(F1) At least 5 working days before first commencing the environmentally relevant activity at each location, the licensee must give, to the nearest district office of the administering authority, written notice of the activity's location and its expected period of operation at the site.

(F2) At least 5 working days before first commencing the environmentally relevant activity at each location, the licensee must give to the occupiers of all "noise sensitive places" and "commercial places" within 600 metres of the proposed site of the activity a notice stating:

(a) the name of the licensee; and
(b) the fact that the plant will be starting operations; and
(c) the expected starting and ending dates for operations at the site; and
(d) the expected daily operating hours of the activity; and
(e) the name and telephone number of the person in the licensee's organisation who can be contacted to deal with any noise nuisance arising as a result of the licensee's operations; and
(f) that, if unforeseen circumstances necessitate extension of operations beyond the expected ending date, notice of this will be given promptly.

(F3) The licensee must take reasonable and practicable measures to minimise noise emissions from carrying out the environmentally relevant activity during the hours of 6 am to 6 pm.

(F4) If a complaint is made about noise emissions from the carrying out of the environmentally relevant activity during the hours 6 pm to 6 am, and if the complaint is not resolved to the reasonable satisfaction of the complainant within 21 days of its having come to the notice of the licensee, the following noise limits will apply until the complaint is resolved to the reasonable satisfaction of the complainant:

(a) The level of noise emitted from the environmentally relevant activity, when assessed as the "adjusted maximum noise level" ($L_{Amax\,adj,T}$) within a "noise sensitive place" using an "approved instrument", must not exceed the noise level specified in Table 1, column 2 in any of the time periods set out opposite the level in Table 1, column 1.

Table 1: Noise limits within a "noise sensitive place"

Column 1: Time period: during which the noise limits in column 2 must not be exceeded	Column 2: Noise limits: assessed as the "adjusted maximum noise level" ($L_{Amax\,adj,T}$)
6pm - 10pm	"background noise level" plus 5dB(A)
10pm - 6am	"background noise level" plus 3dB(A)

(b) The level of noise emitted from the environmentally relevant activity, when assessed as the "adjusted maximum noise level" ($L_{Amax\,adj,T}$) at the boundaries of a "commercial place" using an "approved instrument", must not exceed the noise level specified in Table 2, column 2 in any of the time periods set out opposite the level in Table 2, column 1.

Table 2: Noise limits at the boundary of a "commercial place"

Column 1: Time period: during which the noise limits in column 2 must not be exceeded	Column 2: Noise limits: assessed as the "adjusted maximum noise level" ($L_{A\max adj,T}$)
6pm - 10pm	"background noise level" plus 10dB(A)
10pm - 6am	"background noise level" plus 8dB(A)

(F5) Where noise measurement and assessment are necessary, the method of measurement and assessment and the format for reporting results must be in accordance with the current edition of the Noise Measurement Manual published by the Queensland Department of Environment and Heritage, 2nd edition dated 1 March 1995.

End of conditions for Schedule F

SCHEDULE G – WASTE MANAGEMENT

General

(G1) Except for the burning of vegetation in a pitburner, the holder of this environmental authority must not—

(i) allow waste to burn or be burned at or on any licensed place to which this licence relates; nor
(ii) remove waste from any such licensed place and burn such waste elsewhere.

Settling Pit Areas

(G2) Land areas used for stormwater settling pits at each plant site must be restored with solid fill before the plant is moved to another site.

End of conditions for Schedule G

SCHEDULE H – MONITORING AND REPORTING

Complaint Recording

(H1) All complaints received by the holder of this environmental authority relating to releases of contaminants from operations at the licensed place must be recorded and kept with the following details:

(a) time, date, and nature of complaint;
(b) type of communication (telephone, letter, personal etc);
(c) name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then "Not identified" is to be recorded);
(d) response and investigation undertaken as a result of the complaint;
(e) name of the person responsible for investigating complaint; and
(f) action taken as a result of the complaint investigation and signature of responsible person.

Monitoring of Contaminant Releases to the Atmosphere

(H2) Ambient particulate monitoring must be undertaken to investigate any complaint of dust nuisance upon receipt of a request from the administering authority to carry out such monitoring.

(H3) Analysis of the obtained samples must be made for the following:

i. total water insoluble dust in milligrams; and
ii. dust fallout in milligrams/square metre/day.

(H4) The samples must be collected and analysed in accordance with the requirements "Australian Standard AS3580.10.1 - 1991 for Ambient Air - Particulate Matter".

Receiving Waters Monitoring Program

(H5) The holder of this environmental authority must monitor the visual impact of the environmentally relevant activity on the environment by undertaking twice-daily observations and recording of:

(i) the extent of the turbidity plume caused by dredging; and
(ii) leakage/spills of any petroleum products (specifically oil and grease) within the works area; and
(iii) the influence of wind and flow conditions on dispersal of the turbidity plume and any petroleum products; and
(iv) the length of time any petroleum products and the turbidity plume exists after each day's dredging has ceased.

(H6) The holder of this environmental authority is responsible for making of determinations of the effects of the release of contaminants on the receiving waters to check compliance with Schedule C, Condition (C2) of this environmental authority.

(H7) Monitoring of the receiving waters must be conducted as often as necessary to check compliance with Schedule C, Condition (C2) of this environmental authority but not less frequently than weekly during the dredging works or rehabilitation works are occurring. Monitoring must include representative samples of when waters are being diverted around the dredging site.

End of conditions for Schedule H

SCHEDULE I – DEFINITIONS

(I1) Unless otherwise defined below, words used in this environmental authority have the meaning contained in the Environmental Protection Act 1994 and the Environmental Protection Regulation 1998.

"adjusted maximum noise level" has the meaning given the term "adjusted average maximum A—weighted sound pressure level" under AS 1055.1—1989 Acoustics— Description and Measurement of Environmental Noise: Part 1—General Procedures.

"approved instrument" for assessing the level of noise means an instrument that complies with the specifications for sound level meters Type 1 or 2 under AS 1259.1—1990 Acoustics—Sound Level Meters: Part 1—Non-integrating or AS 1259.2—1990 Acoustics—Sound Level Meters: Part 2—Integrating—averaging.

"background noise level" has the meaning given the term "background A—weighted sound pressure level" under AS 1055.1—1989 Acoustics—Description and Measurement of Environmental Noise: Part 1—General Procedures.

"commercial place" means a place used as an office or for business or commercial purposes.

"noise sensitive place" means—

(a) a dwelling, mobile home or caravan park, residential marina or other residential premises, but excluding a caretaker house for industrial premises; or

(b) a motel, hotel or hostel; or

(c) a kindergarten, school, university, or other educational institution; or

(d) a medical centre or hospital; or

(e) a protected area, meaning—

i. a protected area under the Nature Conservation Act 1992; or

ii. a marine park under the Marine Parks Act 1982; or

iii. a World Heritage Area, being an area described in the World Heritage List kept under the Convention for the Protection of the World Cultural and Natural Heritage adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organisation on 16 November 1972; or

f) a park or gardens.

End of conditions for Schedule I

ATTACHMENT 7

Soil Testing Results

REPORT

Department of Main Roads Qld
(Cairns Soil Material Assessment - Audit)
(2 Samples Undara, Mt Surprise)

For DMR Qld, Mr. Paul Graham

March 13, 2009

By D Baker BSc

Report: For DMR March 13, 2009

Your REF: Undara, Soil Media Stockpile Sampling

Site Soil Media - Soil Sample Chemical Property Assessment

Introduction:

DMR, Cairns, Mr. P. Graham, Senior Environmental Officer required Environmental Soil Solutions Australia Pty Ltd (ESSA) to sample, analyze and report on a site soil sampled by the client (DMR, Cairns) from Undara, Mt Surprise (UN) road alignment, details listed below as locations for a range of analyses as listed. The samples were collected and received in 1 batch on March 4, 2009.

Two (2) bulk Soil samples, which were taken from 2 different locations, job number ESSA – 09-614. Laboratory analysis is attached and was carried out at the direction of ESSA by Phosyn Analytical & ESSA on behalf of ESSA.

- Soil pH and salt
- Soil Cations (calcium, magnesium, sodium, potassium & Aluminum)
- Exchangeable Sodium Percentage (ESP)
- Cation Exchange Capacity (CEC)
- Nitrate -nitrogen
- Organic Matter,
- Phosphorus,
- Fertility (N, P, K)
- Trace Elements (Cu, Zn, Mn&Fe)
- Sulfate
- Texture
- Boron
- Emerson Aggregate Test
- Soil Particle Size Analysis (Sand (coarse, fine), Silt & Clay)
- Dispersion Index Ratio (R1)

Method:

The bulk site soil media 2 samples from the soil pits from the site were sampled by DMR to characterize the soil for laboratory analysis for a range of analytes as listed in this report and to comment on the suitability as growing media and its tendency to disperse. Samples were sampled with inspection pits. The reports relating to Undara, Mt Surprise sites, site soil is Phosyn (pH & Nutrients) are B040130 A to B. Laboratory numbers are SAA1986 to SAA1987, Particle Size in ESSA 09/09 and Emerson Dispersion ESSA 09/09. These samples are listed in the reports as:

- SAA1986 = Undara Red
- SAA1987 = Undara Grey / Brown

In addition, Calcium to Magnesium ratio ESP (% Sodium /ECEC) and ECEC as defined in Table 2 were determined and discussed.

Table 1 – Summary Media Samples, Soil Properties – Undara , March 4, 2009

Sample No	*Soil pH*	*Elec. Cond dS/m*	*Ca/Mg Ratio*	*ESP Na/CEC%*	*Emerson Number*	*R1 Ratio*	*Clay %*	*Al %CEC*
Grey	5.7	0.01	0.4	1.7	2	0.86**	7	9
Red	6.5	0.02	6.8	0.8	5	0.52**	19	9

** Low Al saturation of CEC

Comment on Results

Introduction

Chemical data for the samples submitted was examined and the following comments are provided for the site in relation to pH, salinity, fertility and dispersion. The soil properties are commented on in the following report on each property & their interactions.

Soil pH

Soil pH for Site soil samples were found to be:
The pH was found for the 2 samples, see Table 1, and values are from 5.7 to 6.5 and are medium to slightly acid.

For Samples (slightly acid soils, Red) – Recommend that min 10 kg/m3 of Agricultural Dolomite or as 2nd choice Agricultural lime @ 10kg/m3 to the soil to address the acid pH and with lime boost Calcium & with dolomite boost Calcium & Magnesium. Add 10 kg for all soils except where pH> 6 to which add 10kg/m3. Agricultural Lime / Dolomite is recommended for soil pH amendment. No Agricultural gypsum required.

For Samples (medium acid soils, Grey / Brown) – Suggest that min 5 kg/m3 of Agricultural Lime or as 2nd choice Agricultural dolomite @ 5kg/m3 to the soil to address the acid pH and with lime boost Calcium & with dolomite boost Calcium & Magnesium. Agricultural Lime / Dolomite is suggested for soil pH maintenance. In addition incorporate 5kg/m3 of Agricultural gypsum to counteract the soil dispersion (see below).

Salts

EC (electrical conductivity) and chloride indicate salt content. Using general ratings salt concentration is ***very low for all the samples tested***. The high rainfall in the area would cause the high leaching environment.

The (very low) EC for the 2 samples is ideal for soil use as planting soil, garden soil and underturf soil uses as is required for this purpose and will not adversely affect plant growth.

Soil Exchangeable Cations

Calcium to magnesium (Ca/Mg) ratios of the 2 soils ranges from grey (0.4) unsatisfactory to 6.8 (red), which is satisfactory (ideal). If Ca to Mg ratio less than 1 or greater than 10 they are not rated as ideal. For these samples ratios Ca/Mg are unsatisfactory for grey soil.

ESP is a soil property measurement that helps to indicate a soil's tendency to disperse and have a tendency to lose aggregation, cause soil impermeability, and promote surface crusting and poor aeration. Values greater than ESP (corrected for soluble chloride) of around 6 is rated as not satisfactory (sodic range) as values of ESP greater than 6 are rated sodic.

On that basis the soils have low tendency to disperse, as ESP is << 6. Both soils are non sodic (ESP <6). These soils also contain very low cations so the effects of the finer fractions (silt and clay) will be significant

for that finer fraction as its ability to sustain plant growth without amelioration would be a problem.

Grey soils have tendency to dispersion , while Red do not.

Emerson Testing results rates the Soils listed in Table 1 as low (red) to high (grey/ brown) dispersive. However the other indicators of soil dispersion such as high ESP does not exist so the conclusion b ased on Emerson & Ca to Mg ratios shows that Red is non dispersive while Grey Brown is moderately dispersive.

Calcium levels are very low and not adequate for plant growth for both with Grey lowest while for both Magnesium levels are very low (red) to low (grey) and both Ca & Mg need boosting. Application of liming agent (***agricultural lime/ dolomite is recommended)*** as suggested will help address these issue as well as maintaining the ideal soil pH's.

In addition, the soil Aluminum is low. For all samples it will not limit the growth or plants. For all the 2 sites the exchangeable aluminum is not of concern.

However, addition of agricultural dolomite or lime and gypsum at suggested rates will ameliorate and increase Ca & Mg availability for plant growth & helping reduce erosion from intense rainfall.

Textures

Textural analysis classes the soils as clayey gravels with low silt.

Dispersion R1

For dispersion ratio R1 the general categories are:
Low Dispersion R1 <0.6, soils Red soils.
Moderate Dispersion R1 >0.6 – 0.8, None
High Dispersion R1 >0.8, Grey Brown Soil

* R1 dispersion ratio determination is reliable. However the high sand in both samples is of interest.

Fertility –

Soil Nitrogen (N), Phosphorus (P) and Potassium (K) & others have been assessed.
In summary,

- N is very *low* and will need to be applied
- Phosphorus is low to *very low*–Samples may suit very P sensitive native plants but additional P will be need to be added to the soil for general plantings and especially turf grass and hydro mulch applied seed species.
- Potassium (K), is *low* and need to be increased for healthy plants especially turf grass

Organic Matter

Organic Matter is below the minimum <3.0% AS 4419 figure for plant growth and is not satisfactory for both samples as a minimum of 3% is required. The samples have < 3% Organic matter and is not sufficient (<0.5 & 0.6% actual, very low). If organic or controlled release fertilizers (CRF) are applied this will ensure nutrients are not leached from the root zone. Incorporation of well-composted organic matter is recommended for both, if possible with (NDI > 0.5) at min'm 20 % by volume is suggested if use for planting media use. The composted organics additive will help counteract dispersion (grey soil) and increase nutrient holding capacity. Under turf will not require added organic matter. For garden use organics will help retain nutrients, reduce dispersibility, retain water and sustainability of any landscaping.

Trace Elements

Trace elements were assessed for this soil and in summary the results are:

- Zinc (Zn) is very low and additional Zn will be essential
- Copper (Cu) is rated extremely to very *low and needs to be added*
- Manganese (Mn) is rated very *low and needs to be added*
- Iron (Fe) is rated *low*
- Boron (B) *is very low and needs to be added*

Any fertiliser amendment would **need** to contain trace elements, other than starter amounts, and also needs to contain Nitrogen (N), Phosphorus (P), (for other than P sensitive plants) and Potassium (K) boosted for most plants especially turf grass to establish.

Summary

These soils are extremely infertile have acid pH's, very low N, very low P, very low K, Low CEC and non -satisfactory (very low) trace element fertility and inadequate in organic matter. Application of appropriate fertilizer as suggested, such slow (controlled release (CRF's) high N) products are recommended as nutrients may be leached if inorganic fertilizers are used CRF rate of 350 – 400kg/ha is suggested for turf grass of product such as Scotts Sierra Blen.

The soils pH are slightly acid and very low calcium and magnesium and low aluminium saturation so agricultural lime,dolomite, gypsum application is required for the soils.

Comment –Dolomite / Agricultural lime additions WILL be required.

NOTE 1 – For slightly acid pH soils On the basis of the samples taken by the client and submitted to the consultant and assessed in this report added dolomite N &P & K fertilizer + organics, for both, (composted organic input for garden use (min 10 % by volume) is required for satisfactory plant growth. NOTE organics not required for turf grass but possibly for hydro mulch. In addition, Agricultural gypsum incorporation would be beneficial. The rate of starter, organic or slow release type fertilizer products incorporated in the soil at placement will depend on type of use and proposed plantings.

NOTE 2 - **For Samples (slightly acid soils, Red)** – Recommend that min 5kg/m3 of Agricultural Dolomite or as 2nd choice Agricultural lime @ 5kg/m3 to the soil. No Agricultural gypsum required.

For Samples (medium acid soils, Grey / Brown) – Suggest that min 10 kg/m3 of Agricultural Lime or as 2nd choice Agricultural dolomite @ 10kg/m3 to the soil to address the acid pH.

In addition incorporate 5kg/m3 of Agricultural gypsum to counteract the soil dispersion (see below).

NOTE 3- Phosphorus loving plants will suffer especially in this soil.

NOTE 3 – Textures are clayey gravels. The sandy clayey texture soils will retain little water and few nutrients because of their very low Cation Exchange capacity addition of soil conditioner amendment will help

increase this desirable property and or fertilizer should be controlled release (CRF) type.

Because of high permeability for clayey soils and to prevent any contamination of surface water by enriched runoff by use of soluble inorganic fertilizers, CRF or coated fertilizers are recommended. Soils with low fertility (low CEC) properties ALL need treatments as specified especially to address the above mentioned soils undesirable properties.

Table 5 – Kennedy Highway- soil amelioration recommendations

Sample Desc	Agricultural Lime/ Agricultural Dolomite	Agricultural Gypsum	Fertiliser / Compost	Soil Compost NDI >0.5
Undara Red Soils	5kg/m3, incorporate (1kg/m2/200mm depth incorporated). AG **DOLOMITE** Preferred	nil	Yes, appropriate to plantings & or grasses	Apply as organic additive @20% by volume
Undara Grey Brown Soils	10kg/m3, incorporate (1-2kg/m2/200mm depth incorporated). AG **Lime** Preferred	5kg/m3, incorporate (1kg/m2/200mm depth incorporated).	Yes, appropriate to plantings & or grasses	Apply as organic additive @20% by volume

personal information

BSc MASSSI

APPENDIX

Soil Analysis Reports
PHOSYN

- B040130 – A to B
- Laboratory Numbers SAA1986 to SAA1987, March 10, 2009

Phosyn Analytical, 1/60 Junction Road,
Andrews, Queensland 4220, Australia
Tel: +61 7 5568 8700, Fax: +61 7 5522 0720
email: phosynanalytical@phosyn.com

Analysis Results (SOIL)

ıstomer MRD CAIRNS
UNDARA RA

Distributor ENVIRONMENTAL SOIL SOLUTIONS
5 DUNPHY ST
SUNNYBANK HILLS
QLD

ɔample Ref UNDARA NO 2 (RED)
Sample No B040130B / SAA1987
·op DATA ONLY

Date Received 04/03/2009

Analysis	Result
pH [H2O]	6.5
pH [CaCl2]	6.0
Organic Matter (%)	0.6
CEC (meq/100g)	4.80
EC (dS/m)	0.02
NO3-N (ppm)	1.0
Phosphorus [Olsen] (ppm)	17
Potassium (meq/100g)	0.31
Calcium (meq/100g)	3.52
Magnesium (meq/100g)	0.52
Sulphur (ppm)	2
Boron (ppm)	< 0.1
Copper (ppm)	0.5
Iron (ppm)	23
Manganese (ppm)	10.1
Zinc (ppm)	0.2
Aluminium (meq/100g)	0.41
Sodium (meq/100g)	< 0.1
Chloride (ppm)	9
Ca base saturation (%)	73.3
K base saturation (%)	6.5
Mg base saturation (%)	10.8
Na base saturation (%)	0.8
Ca:Mg Ratio	6.8
Aluminium (ppm)	37.0
Sodium (ppm)	9.0
Calcium (ppm)	704.0
Magnesium (ppm)	63.0
Potassium (ppm)	121.0
Aluminium Base Sat. (%)	8.50

CLIENTS | PEOPLE | PERFORMANCE

Department of Transport and Main Roads

Report for Undara Gravel Resource Area 92C_002

Review of Environmental Factors

November 2009

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

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1. Introduction

1.1 Background

GHD Pty Ltd (GHD) was engaged by the Department of Transport and Main Roads (DTMR) to undertake a Review of Environmental Factors (REF) for a proposed quarry site located on 102.56 ha adjacent to Undara Rd, approximately four kilometres south of the Gulf Development Road. The site is approximately five kilometres north of the Undara Volcanic National Park in Far North Queensland and approximately 180 – 190 km south-west of Cairns. The location of the proposed quarry site and the extent of the study area is shown in Figure 1. The proposed quarry is required for the extraction of decomposed granite (deco) for road maintenance works in the general area.

1.2 Scope of Works

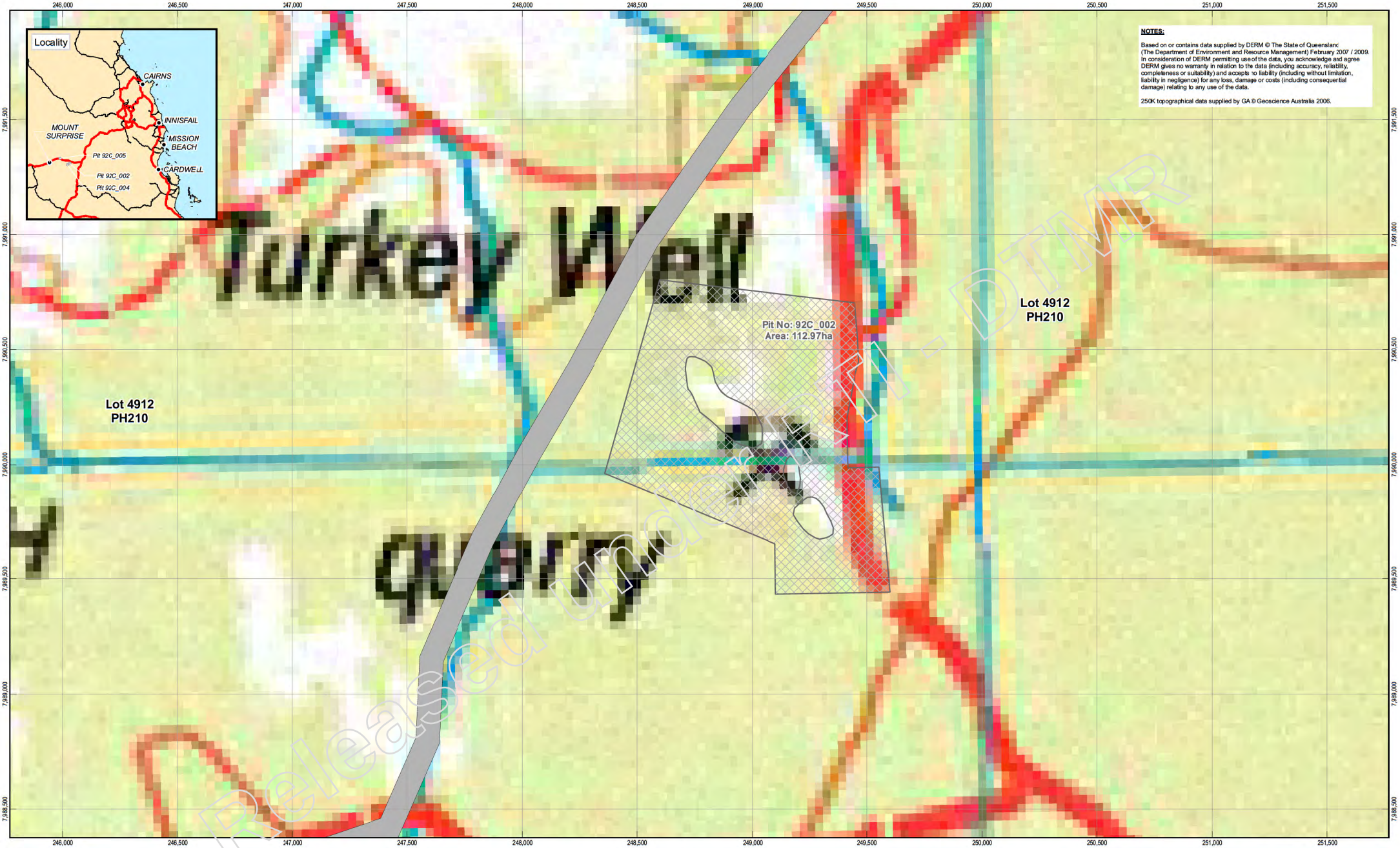
The purpose of this study is to provide information on the general environmental factors present at the project area. This REF is provided as part of an overall investigation into the Tower Gravel Resource Area conducted by the DTMR in accordance with the department's *Guideline – Access, Investigation, Operation and Rehabilitation of Gravel Pits* (Department of Main Roads 2007) (hereafter referred to as the Gravel Pit Guideline). As part of this REF, baseline data and descriptions of the existing environment will be used to identify, describe and assess environmental advantages, disadvantages and constraints associated with the project.

A flora and fauna site investigation was undertaken over one day to determine aspects of the environmental impacts of the project. In particular, the site investigation aimed to identify the presence of rare or threatened species, ground truth regional ecosystems (REs), and determine referral requirements under the *Environmental Protection and Biodiversity Conservation Act 1999* (the EBPC Act). In addition, a soil investigation was undertaken at the site. Soil samples were analysed for selected parameters, specifically in relation to erosion risk and nutrient availability.

1.3 REF Purpose

The main objective of this REF is to identify the existing environment within the study area, to identify any potential impacts associated with the proposed works, and to propose mitigation measures. In particular, this REF will:

- Provide a description of the features and the existing condition of the environment within the proposed works area;
- Identify statutory and legal requirements that may be applicable to the development;
- Identify the likely impacts resulting from the proposed quarry works; and
- Provide recommendations, where appropriate, with regard to additional investigations that may be necessary and any mitigating works that may be required to avoid or minimise adverse environmental impacts.



1:15,000 (at A3)

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Gravel Resource Areas
- Cadastre
- Road

GHD

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Queensland Government
Department of Main Roads

Queensland Department of Transport and Main Roads
Review of Environmental Factors

Pit No 92C_002
Locality

Job Number	42-15991
Revision	A
Date	19 NOV 2009

Figure 1

G:\42\15991\GIS\Projects\REF\92C_002\42-15991_REF_92C-002_Fig01_Locality.mxd

Data source: DTMR (Proposed Gravel Resource Areas - September 2009); DERM (DCDB - February 2009); GA (250K Topographical Data - supplied June 2007). Created by: NDB

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2. Legislative Requirements

2.1 Summary of Environmental Licences, Permits and Approvals

Environmental licenses, permits and approvals relevant to the planning phase of the proposed quarry are summarised in Table 1. This list does not necessarily identify all licenses, permits and approvals, which will be required by contractors during the construction phase.

Table 1 Summary of Licences, Permits and Approvals

Legislation	Administering Authority	Activity	License / Permit / Approval
Commonwealth			
Environmental Protection and Biodiversity Conservation Act 1999	Department of Environment, Water Heritage and the Arts	Submission of referral and further impact assessment documents as required.	Not required. Project is not likely to impact on a matter of National Environmental Significance.
Queensland			
State Development and Public Works Organisation Act 1971	Department of Infrastructure and Planning	Guidelines for preparation of projects where there is the potential for environmental harm.	Implementation of DTMR internal environmental assessment processes, including preparation of this REF.
Integrated Planning Act 1997	Department of Infrastructure and Planning	Nomination of road corridor as vested public infrastructure. Consideration of vegetation clearing as operational works.	Internal planning arrangements for DTMR. Not required. DTMR is exempt for assessment under the planning scheme. Provisions of Section 8 of IPA list exemptions under *Vegetation Management Act 1999* for vegetation clearing permits.
Environmental Protection Act 1994	Department of Environment and Resource Management	Environmentally relevant activities, which have the potential to cause 'serious and material environmental harm'.	Various approvals for different activities classified as "environmentally relevant activities". DTMR are to follow internal processes. At this point it is not known the extent of (1) which activities will be undertaken on site by DTMR, (2) which activities will be undertaken at already approved facilities and (3) which will be undertaken by contractors.

Legislation	Administering Authority	Activity	License / Permit / Approval
Land Protection (Pest and Stock Route Management) Act 2002	Department of Environment and Resource Management	Nominated categories of control for various declared weed and animal pest species.	No permits required. Responsibility for control of declared weeds within the study area is vested with the owner of the land. Scattered plants of the class two weed rubber vine were identified in the study area. All persons and entities have a responsibility not to spread declared weeds or pest species.
Nature Conservation Act 1992 *Nature Conservation (Wildlife) Regulation 2006*	Department of Environment and Resource Management	Clearing of native vegetation. A permit to clear is required for all protected plants. This includes listed threatened species and those native species identified as 'least concern' in the Regulation.	Not required. DTMR advises that they have a permit under the *Forestry Act 1959*. Therefore, they are exempt from the requirement to obtain a permit to clear protected plant species under section 41 of the Nature Conservation (Protected Plants) Conservation Plan 2000.
Vegetation Management Act 1999	Department of Environment and Resource Management	Clearing of vegetation.	Not required. DTMR advise they have an existing approval under the *Forestry Act 1959*. Therefore, they meet the specified activity exemption under the IPA.
Aboriginal Cultural Heritage Act 2003 Queensland	Department of Environment and Resource Management	Impacts or potential impacts, to items of Cultural Heritage Significance.	Demonstration of due diligence requirements under CHA. It is understood that this will be addressed by DTMR internally.
Native Title Act 1993 Queensland	Department of Environment and Resource Management	Suppression of Native Title Rights and Interests that are inconsistent with the easement conditions.	Native Title may still be effective over leasehold land – it is understood DTMR have undertaken a Native Title assessment prior to undertaking the Material Investigation Survey, in accordance with the gravel pit guideline.
Water Act 2000	Department of Environment and Resource Management	Destroy vegetation, excavate or place fill in a watercourse.	Not required as no work will occur within a watercourse.

2.2 Commonwealth Legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides that the Commonwealth is to be involved in matters of 'national environmental significance'. Actions that are likely to have a significant impact on a matter of national significance are deemed 'controlled actions'. Such actions will require referral to the Commonwealth Environment Minister. The Act vests the Commonwealth Environment Minister, in the absence of a referral, with the power to request referral of the proposal.

Under the environmental assessment provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of national environmental significance are subject to an assessment and approval process through the Commonwealth. The Act identifies seven matters of national significance:

- World Heritage properties;
- National Heritage places;
- Ramsar Wetlands of international significance;
- Nationally listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Should there be habitats or species of national significance (as listed under the schedules of the *Environment Protection and Biodiversity Conservation Regulation 2000*) within the study area likely to be impacted negatively by the proposal, then DTMR would be required to submit an EPBC referral to the Commonwealth for further assessment and approval.

However, no matter of national significance will be significantly impacted by this project. Only one species listed under the EPBC Act is considered likely to utilise habitat on the site, the endangered northern quoll (*Dasyurus hallucatus*) (this species was not observed during the survey). However, this species has a large home range and the project area is part of a large area of contiguous habitat suitable for the species. Therefore, no significant impact on the northern quoll is likely.

2.3 State Legislation

2.3.1 *Environmental Protection Act 1994* and subordinate legislation (see below)

General Environmental Duty

To prevent environmental harm, the general environmental duty established under Section 319 of the *Environmental Protection Act 1994* (the EPA) must be observed, and activities must be undertaken with due diligence. The general environmental duty states:

> *"A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm…"*

To act with due diligence, the parties must show that the environmental risk associated with the activity has been assessed and minimised where possible. The EPA binds all persons, including the State. Everyone in the DTMR with a management role is responsible for ensuring that the department's activities comply with the EPA. If a breach occurs, the department's executive officers have committed an offence.

Subordinate Legislation

Subordinate legislation developed under the EPA includes the following:

- *Environmental Protection Regulation 2008*, which details activities that require approval before being carried out, environmental nuisance, ozone depleting substances, national pollutant inventory, used packaging materials, quality standards for petrol and diesel, administration, provisions and prescribed periods.
- *Environmental Protection (Water) Policy 2009*, which states legally binding standards for water quality.
- *Environmental Protection (Noise) Policy 2008*, which states legally binding standards for noise nuisance.
- *Environmental Protection (Air) Policy 2008,* which states legally binding standards for air quality.
- *Environmental Protection (Waste Management) Policy 2000,* which sets out waste management requirements for local and state governments.
- *Environmental Protection (Waste Management) Regulation 2000,* which sets out requirements for receiving and disposing of waste, waste tracking, and management of special wastes.

An Environmentally Relevant Activity (ERA), also referred to as a Chapter 4 activity, is an activity where 'serious and material environmental harm' has the potential to be caused or threatened. GHD understands that a development application for a mobile or temporary ERA is not required as the current licences are active until the end of 2010. DTMR are to follow internal processes.

2.3.2 *Land Protection (Pest and Stock Route) Management Act 2002*

The *Land Protection (Pest and Stock Route) Management Act 2002* provides for the declaration and legislates for the control of, pest plant and animal species.

Pest species are classed as Class 1, Class 2 or Class 3 pests, according to the severity of risk they pose to the economic and natural environment of the state. The classes are defined as:

- Class 1 – The species is not commonly present or established in the State; and has the potential to cause an adverse economic, environmental or social impact in the State, another State or part of the State. Landowners must take reasonable steps to keep land free of Class 1 plants.
- Class 2 – Plants that are established in the State and have, or could have, an adverse economic, environmental or social impact. Landowners must take reasonable steps to keep land free of Class 2 plants.
- Class 3 – Primarily environmental weeds where the plants are established in the State, and have, or could have an adverse economic, environmental or social impact. Landholders are not required to control Class 3 pests unless they are adjacent to an environmentally significant area (as defined by the council). A pest control notice can be issued for weed control on land that is, or is adjacent to, an environmentally significant area.

Under section 46 of the Act, a person must not move or transport machinery or vehicles that it would reasonable to assume may contain reproductive material of a declared pest plant, unless reasonable steps have been taken to remove the material or restrict its spread.

The Act further requires that local governments and government departments with substantial land management responsibilities prepare and regularly update Pest Management Plans (PMPs) for lands within their control. The Etheridge Shire Council's PMP identifies priority pests (animals and plants) within the local government area, and includes strategies for their control or eradication.

The highest priority pest threats for eradication in the Shire are:

- The class two weeds:
  - Parthenium (*Parthenium hysterophorus*),
  - Prickly acacia (*Acacia nilotica*),
  - Giant rat's tail grass (*Sporobolus pyramidalis*), and ,
- The class three weed lantana (*Lantana camara*).

The highest priority pest threats for control within the Shire are:

- The class two weeds:
  - Chinee apple (*Ziziphus mauritiana*);
  - Thorn apple (*Datura* spp.);
  - Parkinsonia (*Parkinsonia aculeata*), and,
- The environmental weeds neem (*Azadirachta indica*) and mimosa (*Acacia farnesiana*) (neither are declared).

The highest priority pests threatening to invade the Shire are:

- The class one weed Siam weed (*Chromolaena* spp.); and,
- The class two weeds bellyache bush (*Jatropha gossypiifolia*) and mesquite (*Prosopsis* sp.).

Only one declared weed species was observed within the Undara Gravel Resource Area – the class two species *Cryptostegia grandiflora* (rubber vine). This species was present as scattered individuals only in very low numbers (less than one plant per hectare). In addition, three mimosa bushes were located near the centre of the gravel resource area.

2.3.3 Nature Conservation Act 1992

The *Nature Conservation Act 1992* (the NCA) establishes a framework for the identification and management of species of conservation significance within Queensland. The Queensland Parks and Wildlife Service (QPWS) are primarily responsible for implementing the NCA.

Under section 73 (a) of the NCA, the QPWS is required to conserve wildlife and its values so as to (amongst other things):

- Ensure the survival and natural development of the wildlife in the wild;
- Conserve the biological diversity of the wildlife to the greatest possible extent;
- Identify, reduce or remove, the effects of threatening processes relating to the wildlife; and,
- Identify the wildlife's critical habitat and conserve it to the greatest possible extent.

The *Nature Conservation (Wildlife) Regulation 2006* (the NCWR) designates the level of protection a native species is given under the NCA. All native flora and fauna species are protected wildlife under the NCA – native species not listed as extinct in the wild, endangered, vulnerable, rare or near threatened are classified as least concern wildlife. In this report, species listed as endangered, vulnerable, rare or near threatened will be collectively referred to as 'rare or threatened'. It should be noted that the rare category will be removed from the NCWR in June 2010, and species currently listed as rare will be reclassified according to the perceived level of threat (most likely most will become least concerned, near threatened or vulnerable) (M. Thomas, Queensland Herbarium, *pers. comm.* 19/10/09).

The NCWR also outlines the declared management intent for threatened wildlife. The declared management intent for threatened wildlife is varies for the different categories of conservation significance, however in general the management intent is:

- To protect the critical habitat, or the areas of major interest, for the wildlife;
- To monitor and review environmental impact procedures to ensure they:
  - (i) accurately assess the extent of the impact, on the wildlife, of the activities to which the procedures relate; and,
  - (ii) provide for effective measures to mitigate any adverse impact of the activities on the wildlife; and,
  - (iii) if there is an adverse impact of the activities on an area in which the wildlife normally lives, provide for the enhancement of other areas where the wildlife normally lives; and, for near threatened wildlife only,
- To take action to prevent the further population decline of the wildlife in the wild.

Under section 71 of the NCA, least concern wildlife (among other categories of wildlife) are protected. Under section 84 of the NCA, ownership of protected plants in Queensland is vested in the Queensland government unless the plant is least concern and on private property, and section 29 of the *Nature Conservation (Protected Plants) Conservation Plan 2000* (the NCPPCP) provides for the Minister to issue permits to clear protected plants.

However, under section 41 of the NCPPCP, an exemption applies if the taking of a protected plant occurs in the course of an activity authorised under another Act. The DTMR advise that they have a quarry license under the *Forestry Act 1959* to undertake the proposed activity on this site, and therefore this activity is exempt under the NCPPCP (and consequently the NCA).

All native flora and fauna identified in the project area were 'least concern'.

2.3.4 State Development and Public Works Act 1971

In accordance with Section 29 of the *State Development and Public Works Organisation Act 1971*, the DTMR must assess the environmental impact of proposed works that have the potential to have significant environmental impacts. In response to this requirement, the DTMR have commissioned this REF to be carried out for the proposed quarry site.

2.3.5 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) makes clearing of native vegetation on freehold and leasehold land assessable development under the IPA.

As part of the process of developing a statewide system for the management of native vegetation on freehold and leasehold land for the VMA, the concept of a regional ecosystem (RE) was developed.

An RE is defined as an area of remnant vegetation within a bioregion, with a broadly defined structure (*e.g.* open forest, grassland, palustrine wetland), with a defined set of dominant species that is consistently associated with a particular combination of geology, landform and soil (Sattler & Williams 1999).

Remnant woody vegetation is defined under the VMA as vegetation that has not previously been cleared, or regrowth where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (EPA 2006).

REs are attributed a vegetation management status under the VMA. The conservation status for each RE is assigned to one of three categories: 'endangered', 'of concern' or 'not of concern', based on an estimate of the RE's pre-clearing distribution, and how much of it remains (EPA 2006).

The DTMR advises that the department has an existing authority under the *Forestry Act 1959* to extract quarry material. Therefore, the clearing associated with this activity is a specified activity as defined in Schedule 10 of the IPA and a clearing approval is not required under that Act.

2.3.6 *Aboriginal Cultural Heritage Act 2003*

The *Aboriginal Cultural Heritage Act 2003* is administered by the Department of Environment and Resource Management (DERM). The Act outlines a cultural heritage duty of care for all persons with guidelines to be complied with (unless an agreement is entered into with the indigenous parties for an area). This Act does not have a permitting system.

Identified items or places of cultural heritage significance are listed on the Cultural Heritage Register and any development or activity must protect these and have regard for potential unknown cultural heritage.

DTMR are undertaking a cultural review internally, and will observe all duty of care requirements under the Act in relation to dealing with potential cultural heritage items and places as may be identified during the construction phase.

2.3.7 *Water Act 2000*

The *Water Act 2000* was implemented to reform water resource management within Queensland. It provides requirements for obtaining a Riverine Protection Permit for earthworks or destroying vegetation in a watercourse. Chapter 2, Part 8 'Riverine Protection' of the *Water Act 2000* provides mechanisms to approve these works in watercourses.

As there is not a watercourse in this gravel resource area, the Water Act will not be invoked.

2.3.8 *Wild Rivers Act 2005*

The purpose of this Act is to preserve the natural values of rivers that have all, or almost all, of their natural values intact. The purpose is to be achieved mainly by establishing a framework that includes the declaration of wild river areas.

To date, 16 rivers have been declared under this legislation. The project area is not located in or adjacent to any of these areas.

2.4 Queensland State Planning Policies

A State Planning Policy (SPP) is a statutory planning instrument that relates to matters of State interest. These policies have legislative force in Queensland and must be referred to and addressed in the consideration of the design, construction, operation and maintenance of the proposed quarry site. Policies relevant to the proposed quarry development are identified below.

SPP 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.

This policy came into effect on 1st September 2003. The purpose of this policy is to set out the State government's interests with regard to natural hazards of flood, bushfire and landslide and how these matters are to be addressed when carrying out assessment for development purposes.

DTMR's road project will be compatible with the policy requirements. The proposed quarry operations will not limit potential access to ground-based fire fighting vehicles and will not impose restrictions upon existing bushfire management techniques. The Queensland Fire and Rescue Service have mapped the study area as being low-medium bushfire risk (Queensland Fire and Rescue Service, 2008).

3. Methodology

This REF has been prepared in accordance with the guidelines outlined in the 'Road Project Environmental Management Processes Manual' (88.102) (Department of Main Roads 2004) and the Gravel Pit Guidelines (Department of Main Roads 2007), and with reference to relevant parts of MRS 11.51 for the development of potential mitigation measures.

3.1 Desktop Literature Review

A general desktop database and spatial review was carried out on the documented natural heritage values of the area. This involved a review of relevant published information including:

- DERM's Wildlife Online databases;
- Search of the Commonwealth Department of Environment Water Heritage and Arts (DEWHA) EPBC Act database for matters of national environmental significance (using the Protected Matters Search Tool) (DEWHA 2009);
- Analysis of the Regional Ecosystem Version 5.0 mapping and corresponding vegetation descriptions (Sattler and Williams 1999); and
- Geological Series mapping held by DERM and the Department of Employment, Economic Development and Innovation (DEEDI).

Database searches were conducted centred on the following area, with a twenty kilometre buffer:

- Latitude: -18.157141,
- Longitude: 144.623640

Further information on likely fauna species present and preferred fauna habitat within the study area was derived from relevant published fauna literature sources (refer to Section 0).

Additional information was derived from the Australia Geological Survey geology and soils mapping database, with climatic information from the Bureau of Meteorology.

3.2 Soil Investigation

Soil testing was undertaken as part of this investigation at one site in the study area (only one site was selected because one single soils unit is mapped over the study area). Soil samples were taken using a shovel along a previously exposed profile. The soil profile was also logged and photographed.

Approximately one to two kilograms of soil was collected and stored in plastic bags. The samples were kept chilled in an esky for transit. Due to delayed transit times, sub samples were frozen so that nutrient testing could be undertaken. Chain of custody documentation was completed for the sample and the samples were transported to SGS Laboratories for analysis.

The soils were tested by SGS for a suite of factors including:

- The Agricultural Suite:
  - pH;
  - Electrical conductivity;
  - Total N, including NO_3 and NO_4;
  - Total and available phosphorus;
  - Chloride;
  - Exchangeable cations (Ca, K, Na, Mg, Al);
  - Suphur;
  - Boron;
  - Organic carbon/organic matter;
  - Trace Fe, Cu, Zn, Mg;
- Cation exchange capacity (CEC) Na, K, Ca, Mg Al;
- Exchangeable sodium percentage (ESP);
- Permeability;
- Particle size distribution;
- Emerson aggregate test; and
- Dispersion index.

General field observations were undertaken to supplement the soil testing. Observations included evidence of erosion, gully slope stability and general potential of the overall site for erosion.

3.3 Flora Surveys

Flora field studies were undertaken with the following specific aims:

- Identification of species and regional ecosystems (RE's) of conservation significance;
- RE integrity and conservation status as determined under the NCA and subsequent Regulations, and the VM Act;
- Weed identification;
- Identification of any significant flora; and
- Identification of possible impact mitigation measures.

Field investigations consisted primarily of preliminary characterisation of distinctive ecological communities across the gravel resource area, including an assessment of the structural characteristics and species composition of each community, and meandering and targeted habitat searches for threatened species.

3.4 Fauna Surveys

3.4.1 Habitat Assessments

Fieldwork consisted of habitat surveys and opportunistic observations habitat utilisation. Evidence of habitat usage by fauna and the habitat values present were noted, and in particular:

- The presence of nesting / shelter sites such as tree hollows, litter, fallen timber, hollow logs, decorticating bark and log;
- Evidence of predation, tracks, scats, and digging;
- Cover abundance of ground, shrub and canopy layers and flowering characteristics of shrubs and trees;
- Emergent vegetation within and around water bodies and the presence of free water;
- Rocks and basking sites for reptiles;
- The extent and nature of previous disturbances;
- Rocky outcrops and other potentially significant habitats; and
- Actual fauna sightings were noted.

The survey targeted habitat and evidence of threatened and significant species predicted to occur within the study area. Adjacent land uses with potential to impact the environment were also identified.

3.4.2 Scat Searches

Searches for scats were undertaken within the project area with searches targeting yakka skink (*Egernia rugosa*) sites, faeces associated with ground dwelling animal foraging sites and areas surrounding feed trees. In addition, any indirect evidence of fauna (i.e. feathers, fur, tracks, dens, nests, scratches and chew marks) was recorded.

3.4.3 Hollow Bearing Trees

Hollow bearing trees are a vital resource for many native fauna species including microchiropteran bats, arboreal mammals and birds.

Details recorded in the study area included:

- Tree height;
- Number of trees; and
- Number of hollows.

4. Existing Environment

4.1 Climate

The nearest climate station to the project area for which rainfall data is readily available is located at Mount Surprise township (Site number 030036, 18.15 °S 144.32 °E) (Bureau of Meteorology 2009). Key climatic conditions identified through a review of the climatic weather station data are as follows:

- The annual mean maximum temperature is 31.1°C and annual mean minimum temperature is 16.1°C;
- The annual mean rainfall is 792.3 mm;
- Approximately 94% of the rainfall occurs during the wet season (November to May) with potential for significant rainfall events during this period; and
- 49.5 mm of rainfall occurs during the dry season (June to October), with between 0.9 and 1.3 rainy days per month.

The monthly mean climatic conditions identified by the Bureau of Meteorology are identified in Table 2.

Table 2 Mean monthly climatic conditions for Mount Surprise

Statistic (Mean)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum temp (°C)	33.1	32.3	31.7	30.7	28.5	26.6	26.5	28.5	31.2	34.2	35.1	34.7
Minimum temp (°C)	20.9	30.9	19.4	16.7	13.4	10.5	9.6	10.6	13.9	17.2	19.7	20.6
Rainfall (mm)	208.8	205.5	111.8	28.4	14.4	14.2	7.4	4.6	5.2	18.1	53.2	115.3
Rainy days	8.8	8.4	4.8	1.5	0.9	0.9	0.6	0.3	0.4	1.3	3.3	5.8

The Bureau of Meteorology also monitors relative humidity and wind parameters at Mount Surprise (but not evaporation). The average annual relative humidity in morning is 62% and in the afternoon it is 37%. Relative humidity varies slightly during the wet and dry seasons. Winds are generally south easterly, they are more varied in the afternoon. The average annual wind speed in the morning is 7.9 km/hr and in the afternoon it is nine kilometres per hour. The wind speed and direction vary daily and can increase in adverse weather conditions. Evaporation is recorded at Georgetown (80 km west of Mount Surprise), where the average annual evaporation is six millimetres (this increases during the wet season).

4.2 Geology and Soils

4.2.1 Topography

The elevation of the study area is approximately 700-750 m AHD (ASRIS 2009). The main topographical features of the general area include Mount Firth (at 774 m) approximately four kilometres west of the study area, Rangaranga Hill (at 882 m) approximately four kilometres southeast of the study area, the Granite Range approximately 15 km west and the Great Dividing Range approximately 15 km east. The study area is comprised of a combination of flat areas with various ecological components and rolling rises (granite tors).

4.2.2 Geology

Geology and geological features are described in the DEEDI Queensland Mines and Energy Interactive Resource and Tenure Maps (DEEDI, 2009). The study area's dominant geological unit is the Tertiary-Quaternary McBride Basalt Group. The lithology of this group an olivine basalt. The geological unit to the west of the study area is the Late Carboniferous Whitewater Creek Granite. The lithological summary of this group is given as biotite granite with subsidiary porphyritic microgranite. Sections of the geology in the surrounding area are overlain by Tertiary-Quaternary colluvium and alluvium, particularly in areas near watercourses.

4.2.3 Soils

According to CSIRO (ASRIS 2009) soil mapping, soils in the study area are Hydrosols, further classified as soil unit Mw46. Mw46 soils occur on gently undulating to undulating lands with rocky rises / granite outcrops. The dominant soils are loamy or sandy red or yellow earths, other soils in the unit include deep loamy duplex soils, shallow sands and loamy grey earths. Exposed areas on both flat and sloped surfaces displayed evidence of sheet and gully erosion due to exposure to the elements, i.e. wind and water.

A representative soil sample was analysed by SGS laboratories (NATA accredited) for a variety of parameters. The soils in the soil profile, as identified on site, included light brown sandy gravel with clay (0-0.30 m) and mottled red brown clayey gravel with sand (0.30-0.60 m). The soil profile was dry and of medium density. The particle size analysis identified the following (the remainder is a coarse gravel mix):

- 20% fine gravel (<2.36 mm);
- 7% coarse sand (<600 µm);
- 3% medium sand (<300 µm);
- 8% fine sand (<212 µm); and
- 10% silt and clay (<75 µm).

Table 3 Soil testing results and interpretation of the results

Parameter	Unit	LOR	Result	Relevance	General Limit Indicator of Good Quality Soil [1]	Implication for the Quarry Works
pH	pH Units	0.1	6.0	Indication of soil chemical fertility and requirement of amelioration. Provides an indication of the availability of plant nutrients and relates to plant growth requirements.	6-7 for neutral soils	The results indicate that the soils are neutral and that no specific actions in relation to pH are required.
Electrical Conductivity	µS/cm	5	13	Indication of salinity and measure of dissolved salt concentration. Contributes to soil structure.	Soils with EC value greater than 2,500µS/cm are considered saline	The soils are not saline.
Total Nitrogen (as N)	mg/kg	5	340	Essential nutrient for plant growth. Nitrogen is one of the most commonly limiting nutrients in agricultural production systems. Legumes are able to fix nitrogen from the air, but other plants are reliant on the soil and/or fertiliser for nitrogen.	500-3,000 mg/kg for satisfactory vegetative growth	The low nitrogen levels in the soil indicates that the addition of ameliorants such as fertilizer may be required to ensure optimisation of plant growth.
Total Phosphorus	mg/kg	5	57	Essential nutrient for plant growth.	>20 mg/kg required for satisfactory vegetative growth	Phosphorous levels are above that required for plant growth; as such no action is required.
Total Carbon	% w/w	0.05	1.09	Carbon is essential for plant growth due to its effects on other soil properties. Organic matter is important since it binds soil particles together into stable aggregates, which are necessary for soil structure stability.[2]	>2%	Low carbon levels indicate reduced potential for plant growth. Such conditions may require ameliorants to create soil conditions suitable for plant growth. Soil stability can also be a problem with low carbon levels.
Exchangeable Sodium	%	1	2	Important indicator of soil structural stability and susceptibility to erosion processes. Indicator of how sodic or dispersive a soil is.	Non sodic ESP <6% Sodic ESP 6-15% Strongly sodic ESP >15%	The low ESP indicates that the soils are non sodic and hence are low dispersion soils. Indicating that there is a relatively low potential for chemical erosion.

Parameter	Unit	LOR	Result	Relevance	General Limit Indicator of Good Quality Soil [1]	Implication for the Quarry Works
Exchangeable Potassium	%	1	20	Essential element for plant growth. Potassium, although usually abundant in soils, has only a small percentage present in forms readily available for plant uptake. Sandy soils typically have the lowest potassium content, clay and alluvial soils the highest.	>2% is recommended for stable plant growth	The potassium levels are well above the recommended level, no action is required.
Exchangeable Calcium	%	1	35	Important indicator in determining soil physical and chemical characteristics, i.e. structure and pH. Calcium ions cause soil colloids (clay platelets) to bond or aggregate together, forming crumbs or peds. Soils dominated by calcium are friable and well structured, have good internal drainage, and are suitable to plant growth.	60-80% is the recommended range	The exchangeable calcium levels are slightly low indicating there is potentially low aggregation of soils, low internal drainage and root growth may be slightly impaired.
Exchangeable Magnesium	%	1	43	Indicator of soil structure. Magnesium plays a key role in the photosynthetic process of plants, being an important constituent of chlorophyll, the green pigment in leaves and stems.	15-25% is the recommended range	The exchangeable magnesium is slightly elevated, indicating that the soil structure is hard.
CEC	meq%	0.01	1.7	Indicator of soil fertility because it indicates the soil's ability to supply important plant nutrients such as calcium, magnesium and potassium. CEC is also a general guide to the availability of nutrients to plants.	>4	Soils with a low CEC have a much higher percentage of cations in the soil water, so are more susceptible to nutrient loss by leaching.
Saturated Hydraulic Conductivity	mm/hr		200	Permeability (saturated hydraulic conductivity) refers to the ease of gas and liquid movement and provides an indication of runoff and erosion potential.	<30 mm/hr indicates slow infiltration, during heavy rainfall events excessive runoff may occur	310 mm/hr is a high infiltration rate, indicating that soils will have high water content, this may result in less runoff.
Bulk Density	mg/m^3		1.4	Bulk density reflects aspects of the soil structure and provides an indication for root growth and permeability.	Bulk densities >1.6 mg/m^3 can restrict root growth	The bulk density is near average for soils.

Parameter	Unit	LOR	Result	Relevance	General Limit Indicator of Good Quality Soil [1]	Implication for the Quarry Works
Dispersion Index	%		32	Dispersive soil is likely to swell strongly when wet, further restricting water and air movement. Dispersion of soil slows down the intake of water to the root zone following rainfall or irrigation.	A high dispersion index indicates low structural stability	The dispersion index is low to moderate level indicating fair soil structure and low to moderate erosion potential.
Emerson Aggregate Test (EAT)			5	Indicator of soil structure stability according to the coherence of soil aggregates in water. The Emerson Classification Number (ECN), determined from the EAT, is particularly useful in relation to the behaviour of tilled surface layers. [3]	Class 1 – slaking and complete dispersion on submersion of sample with deionised water Class 2 – slaking and some dispersion on submersion of sample with deionised water Class 3 – dispersion after remoulding soil at field capacity water content and re-submersion Class 4 – no dispersion after remoulding and re-submersion Class 5 – dispersion after shaking of aggregate solution Class 6 – no dispersion after agitation	Slaking and dispersion are indicative of poor structural stability. These soils present physical limitations to plant establishment and indirect nutritional limitations as a consequence of reduced water retention and increased erosion potential. As a general rule of thumb higher ECN are preferred. Class 5 indicates that the soils have good structural stability, increased water retention and decrease erosion potential.

Notes: 1: Source of information The Nature of Properties and Soil 2002, and Australian Soils and Landscapes 2004

2: Source of information Department of Mines and Energy Soil Properties: Soil organic carbon (pH) (indicator status for advice)

3: Source of information the Victorian Department of Primary Industries, Soil glossary

Further laboratory analysis was conducted. A summary of the results is displayed in Table 3, the complete results are included in Appendix C (refer to Site 1 results). Table 3 also includes a summary of the parameters purpose and an interpretation of the soil results.

The main results indicate that:

- The soils are neutral and are not saline;
- There are low nitrogen and carbon levels in the soils indicating that there may be a reduced potential for plant growth;
- The Exchangeable Sodium Percentage is low, indicating that the soil is non sodic soil with low dispersion; and
- Saturated hydraulic conductivity is high indicating high infiltration levels and lower levels of runoff.

In summary, the laboratory analysis revealed that the soils are a gravel with sand and clay and low nutrient availability. The erosion potential for the soils is low due to the results summarised in Table 3. In particular the dispersion index and emerson class number indicate soils with moderate structural stability and low dispersion potential.

4.3 Surface Hydrology Features

The study area is within the Gilbert Catchment, and the Einasleigh Sub-catchment. Water use and management in the area is regulated under the Southern Gulf Water Resource Plan. The DERM identifies no declared watercourses within the study area. Similarly, during the field investigation there was no evidence of drainage lines within the study area. The closest watercourse, as identified by DERM mapping is White Water Creek, approximately one kilometre west of the study area.

4.4 Flora

4.4.1 Desktop Surveys

Desktop surveys were conducted to determine RE mapping and generate a list of species known to occur within a 20 km radius of the study area. The EPBC Act protected matters search tool was used to predict species listed as threatened at a Commonwealth level that may be present in the study area

Regional ecosystem mapping

Remnant vegetation mapping (see Figure 2 and the online RE mapsheet in Appendix A) show three RE's are mapped over the Undara Gravel Resource Area – the not of concern REs 9.12.1, 9.12.3 and 9.12.36 (all RE classifications are as listed under the VMA unless otherwise stated). These REs are described in Appendix B, together with descriptions for REs mapped immediately adjacent to the study area. With the exception of one area of an of concern RE located approximately 1.5 km to the south west, the mapsheet on which the Undara Gravel Resource Area is centred in Appendix A contains only not of concern REs (a mapsheet covers an area of 506.25 km^2 or 22.5 x 22.5 km).

Threatened species in the study area

Nine species have been identified from records located within 20 km of the study area. These species and their habitat requirements are outlined in Table 4. Of the species in this list, *Brachychiton albidus, Phyllodium pulchellum* var. *pulchellum* and *Solanum multiglochidiatum* have habitat requirements that are met within the study area, and it is considered possible that these species could be present.

Protected Matters search tool results

No species of flora were identified in the protected matters search tool results.

4.4.2 Essential Habitat

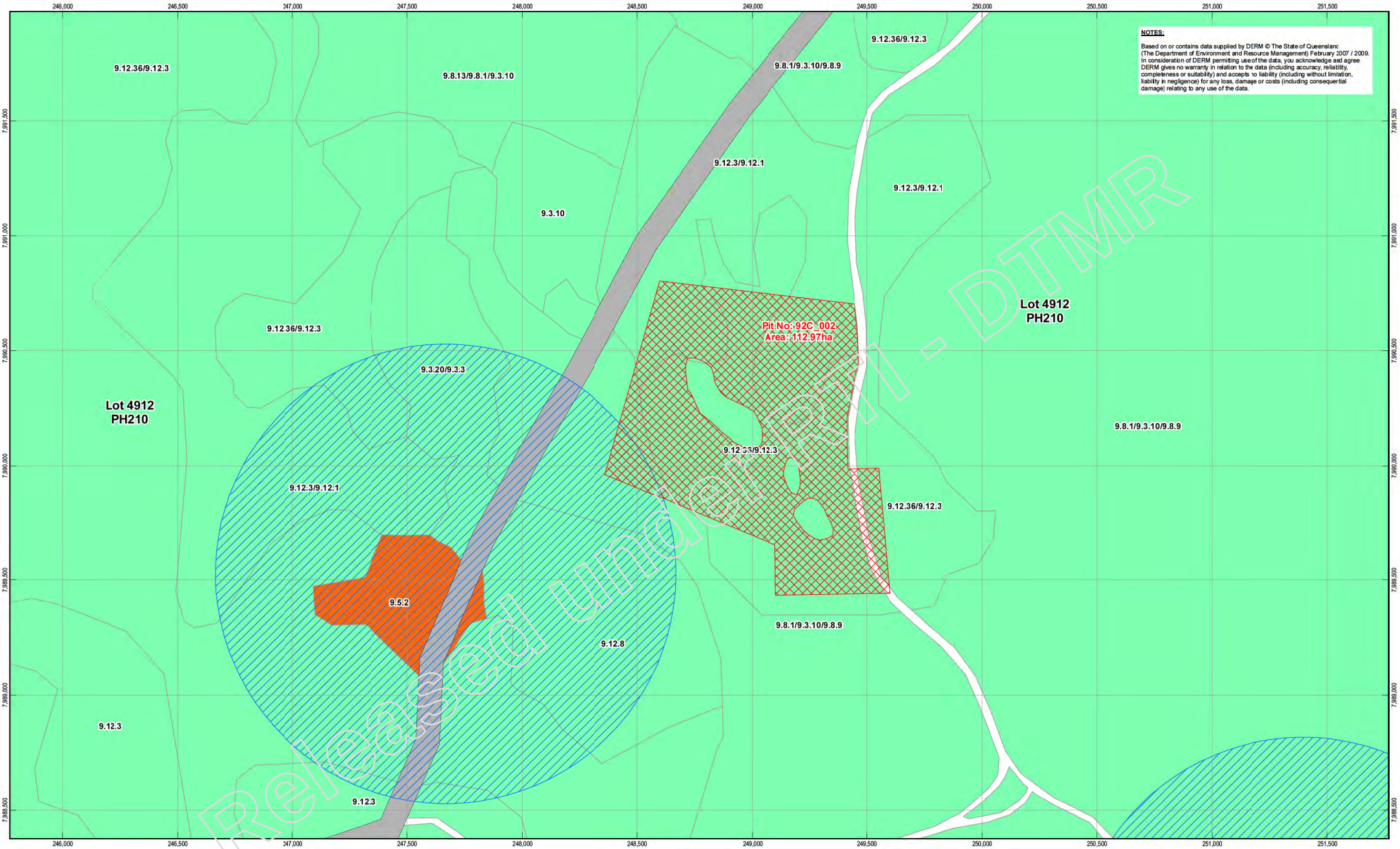
A small area in the south west of the Undara gravel resource area has been mapped as essential habitat for the rare species *Ipomoea saintronanensis* (see Figure 2). The shape of this essential habitat polygon is circular, indicating that it is based on an actual known location for the species. The polygon is comprised mainly of a two kilometre buffer, which has been drawn around the coordinate of the previous discovery. Essential habitat has also been mapped within the local area for the rare species *Acacia jackesiana* and *Solanum multiglochidiatum,* and the vulnerable species *Lepturus minutus*. No habitat factors have been nominated for any of these species, as it is stated that all are only known from National Parks (despite the fact that the essential habitat mapping for these species in this area has been located on leasehold land).

However, suitable habitat for *I. saintronanensis* is not present in the project area (see Table 4), and this species was not detected during the site inspection. Habitat for the other species is also not present, with the exception of *S. multiglochidiatum*. As with *I. saintronanensis*, *S. multiglochidiatum* was also not located within the gravel resource area.

4.4.3 Field Assessment – Vegetation Communities

The Undara Gravel Resource Area was inspected in early October 2009, during the mid-dry season. This area consists of undulating plains with rises or tors of granite interspersed across the site. The rises are characterised by outcropping granite and granite boulders and are generally between 20 and 30 m in height, rising abruptly from the surrounding plain with a slope of approximately 8 to 10 %. The soil of the plains was predominately a sandy loam, apparently derived from the granite bedrock that underlies large areas of the region.

Two vegetation communities were observed in the gravel resource area. A woodland to open woodland dominated by narrow-leaved ironbark (*Eucalyptus crebra*), and with broad-leaved carbeen (*Corymbia confertiflora*), red bloodwood (*C. erythrophloia*) and Darwin woollybutt (*E. chartaboma*) subdominant was the main vegetation community on the site. This community has a very sparse shrub layer characterised in the main by bushman's clothes pegs (*Grevillea glauca*) and quinine bush (*Petalostigma pubescens*), and a mid-dense ground layer dominated by black spear grass (*Heteropogon contortus*).



1:15,000 (at A3)

0 100 200 300 400 500

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Proposed Gravel Resource Areas
- Cadastre
- Road
- Essential Habitat

Regional Ecosystem Mapping

- Of concern (dominant)
- Not of concern
- Non-remnant

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Queensland Government
Department of Main Roads

Queensland Department of Transport and Main Roads
Review of Environmental Factors

Job Number 42-15991
Revision A
Date 16 OCT 2009

Pit No 92C_002 Existing RE Mapping

Figure 2

G:\42\15991\GIS\Projects\REF\92C_002\42-15991_REF_92C-002_Fig02_RE.mxd

Data source: DTMR (Proposed Gravel Resource Areas - September 2009); DERM (Essential Habitat - July 2007; DCDB - February 2009; RE Data - October 2009). Created by: NDB

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Table 4 Flora species of conservation significance identified as present, or potentially present within study area

Species name	EPBC Act status*	NCA status*	Habitat requirements of species	Likelihood of occurrence	
Acacia jackesiana	NL	R	A low shrub found in open eucalypt woodlands on hills with rocky, skeletal soils (Calvert, Lokkers and Cumming 2005)	**Moderate**	Image Source: (Calvert et al, 2005) 
Atalaya calcicola	NL	R	A tree to 10 m found in vine thickets on skeletal soils on rocky outcrops, usually of limestone. Fire sensitive (and so unlikely to be found where regular fires are experienced (Calvert et al 2005)	**Low**	Image Source: (Calvert et al, 2005) 

Species name	EPBC Act status*	NCA status*	Habitat requirements of species	Likelihood of occurrence	
Brachychiton albidus	NL	R	Known from deciduous woodlands growing on rock outcrops (granite, basalt or sedimentary), vine thickets and (less often) eucalypt woodlands (Guymer 1988)	**Possible**	Image Source: (Calvert et al, 2005) 
Habenaria hymenophylla	NL	R	This species is known to occur in leaf litter within rainforest and monsoon forest often close to the coast. It grows in well-drained sandy loam in dappled shade or laterite patches (Jones 2006)	**Low**	No image available
Ipomoea saintronanensis	NL	R	A scrambling vine found in deciduous vine thickets, chiefly on basalt-derived soils (Johnson 1986)	**Low**	No image available
Lepturus minutus	NL	V	A grass to 20 cm tall found in semi-deciduous vine thickets in North Queensland (Nightingale, Simon and Weiller 2005)	**Low**	No image available

Species name	EPBC Act status*	NCA status*	Habitat requirements of species	Likelihood of occurrence	
Lysiana filifolia	NL	R	A mistletoe known to parasitise *Casuarina* spp., mostly *C. cunninghamiana* , a riparian species (Barlow 1982)	**Low**	Image Source: (Calvert et al, 2005) 
Phyllodium pulchellum var. pulchellum	NL	R	A shrub usually found among boulders on hillslopes in eucalypt woodland, or along the edge of coastal vine forests (Pedley 1999)	**Possible**	Image Source: (Calvert et al, 2005) 
Solanum multiglochidiatum	NL	R	A herb to 40 cm tall, known the Lakeland Downs to Forty Mile Scrub region. Usually found in eucalypt woodland dominated by *Eucalyptus cullenii, E. leptophleba* or *Corymbia dallachiana* (Bean 2004).	**Possible**	No image available

EPBC Status Codes = conservation dependent (CD), critically endangered (CE), endangered (E), extinct (EX), extinct in the wild (XW) and vulnerable (V)

NCA Status Codes =: The codes are extinct in the wild (Ex), endangered (E), vulnerable (V), rare (R) or near threatened (N).

In places within this community open forest to woodland comprised of Darwin woollybutt exclusively was observed. This community was of limited extent and had a similar shrub and ground layer composition and structure to that of the main community type. This community meets the definition of the not of concern RE 9.12.3, and is characteristic of the vegetation community present across large areas of the Einasleigh Uplands on undulating plains of granite-derived soils. This RE is estimated to cover approximately 90 % (90 ha) of the site.

The second vegetation community was restricted to the granite rises, and comprised open woodland dominated by narrow-leaved ironbark and red bloodwood with an open shrub layer containing species such as canarium (*Canarium australianum* var. *australianum*), yellow tulipwood (*Drypetes deplanchei*), wild prune (*Pouteria sericea*), kapok (*Cochlospermum gillivraei*), ivorywood (*Siphonodon australis*), quinine bush, smooth leaved quinine (*Petalostigma banksii*), prickly pine (*Bursaria incana*),ochra (*Larsenaikia ochreata*), Townsville wattle (*Acacia leptostachya*), rusty fig (*Ficus rubiginosa*) among others. This vegetation community meets the definition of the not of concern RE 9.12.36 (see Appendix B). This RE is estimated to cover approximately 10% (10 ha) of the site.

Although the habitat within the project area is considered to be suitable for the rare species *Brachychiton albidus, Phyllodium pulchellum* var. *pulchellum* and *Solanum multiglochidiatum*, these species were not recorded in the study area. It should be noted that the hot, dry conditions meant that many of the flora species present at the site were not in evidence. However, all of the threatened species considered likely to be present in this habitat type would generally still be evident in the dry season, being trees (*Brachychiton albidus*) and shrubs or perennial herbs (*P. pulchellum* var. *pulchellum* and *S. multiglochidiatum*). A full species list is provided in Appendix D.

4.4.4 Field Assessment – Weed Species

Weed species considered to be of greatest threat to natural and economic values on a national basis have been ranked as "Weeds of National Significance" (WONS) (Thorp and Lynch 1999). They assessed weed significance using four major criteria:

- Invasiveness;
- Impacts;
- Potential for spread; and
- Socio-economic and environmental values.

At a State level, the *Land Protection (Pest and Stock Route Management) Act 2002* identifies pest plant and animal species, and provides for their control. The *Land Protection (Pest and Stock Route) Management Act 2002* also requires the development, and regular review, of a Pest Management Plan (PMP) by local governments.

The Undara Gravel Resource Area was relatively weed free – the only declared weed observed was an occasional rubber vine, which was present at a density of less than one plant per hectare. The only other weed of note was mimosa bush (*Acacia farnesiana*), which is similar to prickly acacia (*A. nilotica*) but is not a declared species. This species was present as three small clumps located alongside a road in a neat line and evenly spaced.

4.5 Fauna

4.5.1 Fauna of Conservation Significance

The results of the EPBC and Wildlife Online search were compared with the field observations to identify the likelihood of occurrence onsite of threatened species. The following is a description of the searches undertaken.

Nine threatened fauna species were identified by the DEWHA's protected matters search tool as potentially occurring within 20 km of the study area (see Table 5). There were an additional four migratory terrestrial birds, five migratory wetland bird species, three marine migratory birds and one marine migratory reptile predicted to occur within the study area. The full EPBC Report is supplied in Appendix A.

A search of the EPA Wildlife Online database identified three threatened bird species, four threatened mammal species and two threatened reptile species recorded within the vicinity of the study area by previous researchers. These species and their habitat requirements are outlined in Table 5. The full EPA Wildlife Online listing is supplied in Appendix A.

Table 5 Fauna species of conservation significance potentially present within study area

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Birds					
Erythrotriorchis radiatus red goshawk	Protected Matters	V	E	Habitats consist of tropical and warm temperate Australian woody and riverine forests with tall trees for nesting and usually 1 km from a permanent water source. More specifically, mosaic vegetation such as eucalypt, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest and the margins of rainforest are preferred habitats. Open areas are favoured for ease of flight manoeuvrability but a certain degree of vegetation coverage is required to avoid detection by prey. Occasional sightings of young have been reported in open river, floodplains, mangroves, low open woodland and agricultural land. Major threats include habitat loss through clearing of forests and habitat fragmentation (DEWHA 2009b).	**Low** Predictive database only and only marginal habitat exists within the study area. **Not detected during survey**
Accipiter novaehollandiae grey goshawk	Wildlife Online	-	R	This species utilises a range of habitats including rainforest, forests, forest gullies and valleys, tall woodlands, timbered areas within watercourses and open areas (Pizzey & Knight 2007).	**Low** Habitat requirements not fully represented within study area. **Not detected during survey**
Ephippiorhynchus asiaticus = *Ephippiorhynchus australis* black-necked stork	Wildlife Online	-	R	Habitats include coastal wetlands, mangroves, tidal mudflats, floodplains, open woodlands, irrigated lands, bore drains, sub-artesian pools, farm dams and sewage ponds. The distribution is from coastal and sub-coastal northern Australia from New South Wales to Port Hedland and is also found in Papua New Guinea (Pizzey & Knight 2007).	**Low** Habitat requirements not met during dry season but may be marginal habitat present during wet season. **Not detected during survey**

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Melithreptus gularis black-chinned honeyeater	Wildlife Online	-	R	Dry eucalypt forests and woodlands, timbered waterways, scrubs and ecosystems often lacking understorey (Pizzey & Knight 2007).	**Moderate** Habitat requirements are met. **Not detected during survey**
Neochmia ruficauda ruficauda star finch (eastern), star finch (southern)	Protected Matters	E	E	Habitats for this species include areas near water with grassy flats and bushes, low trees, reeds, rushes, irrigated crops and sugar cane. Numbers were once a lot higher but have been reduced by trapping and reduction of waterside vegetation. Formerly widespread, the distribution in Queensland is sparse and patchy to just across the border to inland NSW (Pizzey & Knight 2007).	**Low** Predictive database only and habitat requirements not met during dry season but may be marginal habitat present during wet season. **Not detected during survey**
Rostratula australis = *Rostratula benghalensis s. lat* Australian painted snipe	Protected Matters	V	LC	This species is uncommon within its range in Australia. The distribution is from Adelaide through to Victoria, New South Wales, Queensland, eastern and northern Northern Territory and to the north west coast of Western Australia. Habitats include shallows with substantial vegetation, wetland margins, dams, sewage ponds, wet pastures, marshes, irrigation areas, lignum, tea-tree scrub and open timbered areas (Pizzey & Knight 2007).	**Low** Predictive database only and habitat requirements not met during dry season but may have habitat present during wet season. **Not detected during survey**

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Mammals					
Dasyurus hallucatus northern quoll	Protected Matters Wildlife Online	E	LC	The northern quoll is found in open eucalypt forest and woodland and is occasionally in patches of rainforest and beaches. Rock crevices, tree hollows, logs, termite mounds, house roofs and goanna burrows are used as den sites. These den sites are usually changed every night. This species once occupied a continuous range from across northern Australia to southern Queensland but this distribution has been reduced to a patchy occurrence throughout the area (Van Dyck & Strahan 2008).	**High** Predictive and database records from the study area and. Habitat requirements are met. **Not detected during survey**
Petrogale Mareeba Mareeba rock wallaby	Wildlife Online	-	R	The distribution of this rock wallaby is between the Mitchell River and Mt Carbine in the north and west to Mungana and Undara Lava Tubes and south to the Burdekin River near Mt Garnet. This species occupies a variety of rock habitats within this range within open forest, grassy woodland and occasionally vine thickets (Van Dyke & Strahan 2008).	**High** Database records from the study area and the species is known to occur in the area. **Not detected during survey**
Macroderma gigas ghost bat	Wildlife Online	-	V	This carnivorous bat uses caves, mines and deep rock fissures as feeding and resting sites. The ghost bat is thought to breed in July or August and bare young between September and November, forming nursery colonies with males. The ghost bat has a patchy distribution from the Pilbara in Western Australia to the rainforests of northern Queensland (Van Dyck & Strahan 2008).	**Moderate to High** Database records from the study area and the species is known to occur in the area. **Not detected during survey**

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Hipposideros diadema reginae diadem leaf-nosed bat	Wildlife Online	-	R	The diadem leaf-nosed bat is only found in northern Queensland and roosts in caves, disused mines, sheds and large road culverts. Females form maternity groups in caves and hunting can take place up to 10 km from the roosting site within forested areas (Van Dyck & Strahan 2008).	**Moderate to High** Database records from the study area and the species is known to occur in the area. **Not detected during survey**
Hipposideros semoni Semon's leaf-nosed bat, greater wart-nosed horseshoe-bat	Protected Matters	E	E	This species occupies wet sclerophyll forest, tropical rainforest, monsoon forest and open savannah. It prefers to roost in trees (tree hollows, strangler figs etc) than caves/rock habitats, but has been observed using old mine shafts, creek banks, rock piles, road culverts, abandoned buildings and other anthropomorphic structures (Thompson, Pavey and Reardon. Unpublished report to the DEWHA). However, the National Recovery Plan for Semon's leaf-nosed bat states that this species is an obligate cave-dweller (Thompson, Pavey and Reardon. Unpublished report to the DEWHA). This species has also been observed roosting in anthropogenic structures (Churchill 2008).	**Moderate** Predictive database records from the study area and habitat requirements are met. **Not detected during survey**
Pteropus conspicillatus spectacled flying-fox	Protected Matters	V	LC	The spectacled flying fox is a specialist frugivore found primarily in rainforest habitats from Ingham to Cooktown, with a disjunct population in eastern Cape York Peninsula (TSSC, 2002). Preferred habitats include tall rainforest and gallery forest. They also frequent mangroves, paperbark, eucalypt and tall Acacia trees (Churchill, 2008). The Spectacled Flying Fox eats the flowers of rainforest and sclerophyll forest. The species is believed to have a more continuous presence along coastal areas, with a more seasonal presence on the Atherton Tablelands believed to be linked to fruiting seasons. Population studies on the Southern Atherton Tableland suggest movement corridors between roost sites may follow watercourses (Hall & Richards 2000).	**Low** Predictive database records from the study area and habitat requirements are marginal. **Not detected during survey**

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Rhinolophus philippinensis (large form) greater large-eared horseshoe bat	Protected Matters	E	E	Two forms of this bat occur in Australia however studies have identified very similar genetic characteristics and it is not possible to confidently separate them as two different species. Distribution is limited to a coastal strip from Townsville to the Iron Range in Cape York Peninsula in coastal and near-coastal regions (Van Dyck a& Strahan, 2008), though the southern limit has not been clarified (DEWHA, 2009c). Roosting occurs in thick foliage, hollows and culverts as captured bats have often been far from any caves or mines (Van Dyck & Strahan 2008).	**Low** Predictive database records from the study area and habitat requirements are partially met. **Not detected during survey**
Sharks					
Pristis microdon freshwater sawfish	Protected Matters	V	LC	The freshwater sawfish has the potential to occur in all northern Australian large rivers from the Fitzroy River, Western Australia, to the western side of Cape York Peninsula, Queensland. Its life history requires access to marine (adult stage) and freshwater systems (juvenile stage). The freshwater sawfish iusually occurs in turbid channels of large rivers over soft mud bottoms and move into shallow waters when travelling upstream or while hunting prey (DEWHA 2009d).	**Nil** Predictive database records from the study area and habitat requirements are not met. **Not detected during survey**
Reptiles					
Acanthophis antarcticus common death adder	Wildlife Online	-	R	The common death adder occupies habitats of rainforest, shrublands and heaths but is in decline, thought to be as a result of habitat destruction and altered fire regimes (Wilson & Swan 2004).	**Moderate to High** Database records from the study area and the species is known to occur in the area. **Not detected during survey**

Species	Source	EPBC Act Status	NCA Status	General Habitat Requirements	Likelihood of Occurrence and Opportunistic Survey Status
Lerista ameles	Wildlife Online	-	R	This species has been recorded in soft soil under granite rocks on low weathered outcrops close to Mt Surprise in north western Queensland (Wilson & Swan 2004).	**High** Database records from the study area and the species is known to occur in the area. **Not detected during survey**
Carlia rococo	Wildlife Online	-	LC	Although nominated in Wildlife Online as rare, this species is actually not listed as of October 2009 and has not been considered further.	**-**
Egernia rugosa yakka skink	Protected Matters	V	V	Habitat for the yakka skink consists of dry sclerophyll forest or woodland. This species will use dense ground vegetation, log hollows, rocks and tree root systems to shelter or they may physically burrow in low vegetation. The preferred habitat is ecotonal forest in rainforest and wet/dry sclerophyll forest (DEWHA, 2009e).	**Moderate** Predictive database records from the study area and habitat requirements are met. **Not detected during survey**

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NCA Status Codes =: The codes are extinct in the wild (Ex), endangered (E), vulnerable (V), rare (R) or near threatened (N).

4.5.2 Essential Habitat

The DERM regional ecosystem mapping has identified essential habitat species records surrounding the study area. These species include: the Mareeba rock wallaby (*Petrogale mareeba*) and the common death adder (*Acanthophis antarctica*).

4.5.3 Opportunistic Fauna Sightings

No listed species were observed during the site investigation and in general, the fauna associated with the existing proposed quarry study area was composed of native species typical to the Undara/Mt Surprise area. The species identified included:

- Red-tailed black cockatoos (*Calyptorynchus banksii*)
- Magpie (*Gymnorhina tibicen*)
- Torresian crow (*Corvus orru*)
- Pied butcherbird (*Cracticus nigrogularis*)
- Laughing kookaburra (*Dacelo novaeguineae*)
- Common bronzewing (*Phaps chalcoptera*)
- Brown honeyeater (*Lichmera indistincta*)
- Australian bustard (*Ardeotis australis*)
- Squirrel glider (tail remnant from predation) (*Petaurus norfolcensis*)

The above species are of low conservation significance and are highly mobile and able to move from the immediate proposed quarry site during excavation. It should be noted however, that the survey was conducted in the late part of the dry season in the first week of October and environmental conditions in the study area were very dry and hot. The leaves of many of the semi and fully deciduous trees had dropped and therefore fauna had limited access to shade. Grasses were dry and mostly without seed, nectar resources for honey-eating birds and arboreal mammals was also limited, and water was not evident in the study area. It is likely that many fauna species disperse to better watered areas, which have a correspondingly higher proportion of other resources such as late-seeding grasses. This may account for the low numbers of fauna sighted in the study area.

There were a number of habitat resources within the study area. Termites mounds were present in the narrow leaved ironbark woodland and evidence of excavation was noted, most likely by echidnas (*Tachyglossus aculeatus*) or other small mammals (quolls are known to occupy termite mounds). The seeds of the Darwin woollybutt provide important seasonal feed for red-tailed black cockatoos, with mid-sized flocks observed in the crowns of these trees during the survey. The granite rises are particularly valuable as habitat. Comprised as they are of what are essentially boulder piles, these areas provide shelter and nesting resources for a number of mammal, bird, amphibian and reptile species, including the endangered northern quoll (*Dasyurus hallucatus*) (see below) and macropods.

These rises are characterised by a higher flora species diversity with a very different composition to that of the surrounding eucalypt woodland, including fruit bearing species such as rusty fig and wild prune. The diversity of shelter and resources attracts a number of smaller species such as skinks and geckoes, which in turn attracts larger carnivorous species, and these rises become 'islands' of diversity within the wider lower diversity woodland 'sea'. In particular, these rises appear to be heavily utilised by wallabies (being slightly higher than the surrounding plain, they may be cooler and offer a good view of approaching predators, and the boulders cast shade).

Numerous stags (dead standing trees) and hollow bearing trees were present in the study area, indicating favourable habitat for gliders and possums. Although not observed during the site investigation, the remains of a glider tail (most likely from a squirrel glider) was found on one of the granite rises. It is considered most likely that this animal had been a meal for a feral cat, as they often leave the tails of their prey behind (Triggs, 2004).

Although not actually observed during the one day site investigation, it is considered highly likely that the northern quoll may be present within the study area. This species has been recorded previously from within 20 km of the study area and many of its habitat requirements are met by the site. In particular, this species is known to favour den sites on low rocky hills (Van Dyck and Strahan 2008). If this species is present in the study area the boulder outcrops and tree and log hollows would be suitable as shelter/den sites. When present in savannah the northern quoll is known to occupy large territorial areas with female averaging approximately 35 hectares whilst male ranges can occupy a range of over 100 hectares (Van Dyck & Strahan, 2008).

4.5.4 Habitat assessment

The study area was traversed to examine the vegetation types present and two major habitat types were identified and described. Tree species present and their resource use by wildlife is summarised in Table 6 and an assessment of habitat quality is given.

4.6 Air Quality

Air quality of the study area and the surrounding environment is of high quality due to the lack of development and proximity of vegetated areas. The only significant impact upon air quality is dust from wind erosion of exposed surfaces and traffic use of Undara Road and the Gulf Developmental Road. There are no sensitive receptors, such as residences, in close proximity to the study area.

4.7 Land Use

4.7.1 Protected Areas

There are no protected areas (Commonwealth or State) within the study area. However, the Undara Lava Tubes National Park is located approximately five kilometres south of the study area. Also of note is the Forty Mile Scrub National Park located approximately 30 km east, and the Undara Lava Tubes themselves, identified as an important wetland under EPBC Act Protected Matters Search Tool Mapping and located over ten kilometres to the south west of the Undara Gravel Resource Area.

4.7.2 General Land Uses

The current land use within the study area is predominantly cattle grazing. A major road (Undara Road) runs along the eastern edge of the study area and several heavy earth moving vehicles were observed to be making cuts into the soil/gravel area. The Undara Resort (located five kilometres to the south) operates a long-standing tourism business based on the Undara Lava Tubes.

4.8 Visual Assessment

The study area is situated among woodlands adjacent to Undara Road. This road is the main entry road for tourists and the general public to gain access to the Undara Volcanic National Park and to the 'Undara Experience' resort. The woodlands that continue along the entire road sides are relatively intact and add to the charm of the area which is one of the major drawer cards to the area for locals from northern Queensland and interstate and international tourists alike.

4.9 Cultural Heritage

Both European and Aboriginal cultural heritage values and places need to be considered. A cultural heritage assessment is currently being undertaken separately to this REF by DTMR. The cultural heritage assessment will detail both European and Aboriginal cultural heritage considerations.

However, as part of the desktop assessment for this REF, database searches of the Australian Heritage Database, administered by the DEWHA, identified the Undara Lava System, Gulf Developmental Road, Mount Surprise as being in close proximity to the proposed quarry site, that is within five kilometres. The Australian Heritage Database also identified the Forty Mile Scrub National Park (1978 Boundary and Redefined) approximately 20 km east of the study area. Queensland Heritage Register (administered by the DERM) did not identify any matters of cultural heritage significance within the study area or the wider area. The closest place listed in the Queensland Heritage Register is the No.53 RDF Station (a defence radar station) located approximately 30 km west of the study area.

Table 6 Summary of fauna survey and habitat descriptions for all sites within study area

Habitat site no	Habitat characteristics	Opportunistic fauna sightings and habitat value	Photo
1	**Boulder outcrop** **Land use** cattle grazing *Eucalyptus crebra* and *Corymbia erythrophloia* open woodland with *Cochlospermum gillivraei* and *Canarium australianum* var. *australianum*. The shrub layer was sparse to very sparse and contained shrubs such as *Drypetes deplanchei, Pouteria sericea, Petalostigma banksii, P. pubescens, Grevillea glauca* and *Acacia leptostachya*. Ground layer contained grasses such as *Heteropogon contortus* and *Aristida* sp.. **Ground cover as per 1m^2 quadrat** Rocky ground cover 60% granite Woody debris on ground cover 0% Bare earth 0% Leaf litter 10% Vegetation 30% **Log piles** evident at base of outcrop from previous clearing	**Fauna sighted** Squirrel glider tail remains Brown honeyeater **Habitat values** Habitat resource for reptiles basking on rocks and shelter sites for macropods and other mammals. Nectar, flower and fruit food resources for arboreal mammals, reptiles and birds.	

Habitat site no	Habitat characteristics	Opportunistic fauna sightings and habitat value	Photo
2	***Eucalyptus crebra* dominated woodland** **Land use** cattle grazing Grassy, leafy ground cover with logs, shrub layer of young saplings and *Grevillea glauca*, *G. mimosoides* and *Petalostigma pubescens.* **Ground cover as per 1m^2 quadrat** Rocky ground cover 0% Woody debris on ground cover 10% Bare earth 2% Leaf litter 40% Vegetation 48% **Logs** scattered throughout with hollows evident in logs and standing trees **Termite mounds present**	**Fauna sighted** Red-tailed black cockatoo Magpie Torresian crow Pied butcherbird Common bronzewing **Habitat values** Tree and log hollows provide nesting habitat for arboreal mammals including possums and gliders and parrots such as pale headed rosellas that were observed in surrounding areas. Leaf litter and logs also provide habitat cover and basking for reptiles. *Corymbia* spp, *Eucalyptus* spp and *Grevillea* spp. also provide nectar and flower food resources for arboreal mammals, reptiles and birds.	

5. Potential Impacts and Mitigation Measures

5.1 Approach

5.1.1 General Approach

This REF considers impacts in terms of the construction, operation and ongoing maintenance requirements of the intersection upgrade. A range of impacts relevant to these aspects were considered, including:

- Flora and vegetation communities;
- Fauna and habitat integrity;
- Introduced flora and fauna;
- Erosion and sedimentation;
- Surface hydrology and water quality;
- Land use and traffic issues;
- Noise/dust/air quality on adjacent receptors; and
- Visual amenity.

Cultural heritage investigations are being prepared independent of this current study. Any Environmental Management Plans developed for the proposed works should include cultural heritage mitigation measures whether or not cultural heritage items are identified to satisfy due diligence requirements.

5.1.2 Impact Assessment Approach

The impact assessment is based on an Environmental Risk and Likely Impact approach ("ERLI").

For each possible potential impact on the environment identified in this report, two key areas in the impact assessment process were considered prior to making a judgment on the predicted impact on each aspect:

1. **Environmental Risk -** This considers the risk of irreversible change to natural ecological processes and community interaction.
2. **Likely Impact -** This considers the likely impact of the proposal, as modified and undertaken in accordance with mitigation strategies (including any environmental management plan).

The significance of any impact is placed in an appropriate context to justifiably determine the impact's significance. In particular, the duration of the impact (temporary versus permanent) and its reversibility has been considered as well as the ability of natural systems (including population, communities and ecosystems) to accept or assimilate the potential impact.

5.2 Climate

5.2.1 Potential Impacts

The key element of the local climate that may influence aspects of the quarry site is the potential for heavy rainfall periods in the wet season and extensive dry periods during the dry season. The rainfall in the wet season has the potential to increase erosion and sedimentation issues associated with the quarry site. Climate in the dry season has the potential to inhibit plant growth and subsequent requirement for irrigation of potential landscaping (for example that associated with rehabilitation procedures). During both seasons there is also the potential for impacts from the prevailing wind conditions, including dust generation and desiccation of plants.

5.2.2 Mitigation Measures

- Ensure that erosion and sediment control mechanisms are implemented in accordance with the IECA (International Erosion Control Association) 2008 Best Practice Erosion and Sediment Control.
- Works are to be undertaken in accordance with the DTMR Gravel Pit Guideline (Department of Main Roads 2007).
- Monitor any landscaping or rehabilitation works to ensure that any prolonged dry conditions are not affected plant establishment and growth.
- Implement measures to limit dust generation during dry periods and strong wind conditions.

5.3 Geology and Soils

5.3.1 Potential Impacts

Several factors need to be considered when evaluating potential impacts on geology and soils from the proposed quarry site development. Factors and impacts include:

- Landslips in excavated areas because of high permeability of soils and steep grades;
- Erosion of sediment from the quarry area to surrounding drainage lines as a result of steep bank creation;
- Erosion of sediment stockpiles of topsoils to be used for revegetation;
- Sedimentation from potential truck spillages onto road surfaces and consequent irrigation into drainage lines;
- Contamination from construction site fuel spills into local soils and watercourses / drainage lines because of high permeability of soils.

Soil erosion impacts are likely at the site due to the nature and purpose of the quarry pit as earthworks are the main purpose of a quarry pit and vegetation removal will be required. During the operation of the quarry site any soil stockpiles will be vulnerable to erosion via rain and wind processes unless they are suitably covered.

The soil testing indicated that the soils have low levels of nutrient (nitrogen and carbon) and a low cation exchange capacity indicating that the soils are susceptible to nutrient loss. Low nutrient levels have the potential to restrict plant growth and hence impact upon the success of rehabilitation measures.

The soils were also identified as being non sodic with low dispersion, having high saturated hydraulic conductivity, average bulk density and an emerson class number of 5 (good structural stability and increased water retention). These results indicate that the potential for runoff and hence severe erosion is naturally minimised onsite. Overall the erosion risk is low; however exposed surfaces may be susceptible to erosion.

5.3.2 Mitigation Measures

- Minimise the area of disturbance for all activities and ensure that the disturbance area is clearly defined.
- Erosion and sediment control measures are to be implemented in accordance with IECA 2008 Best Practice Erosion and Sediment Control and any subsequent plans developed for the project.
- Gravel pits are to be operated in accordance with the DTMR Gravel Pit Guideline (Department of Main Roads 2007).
- Permanent erosion control measures are to be incorporated as part of the post-operation rehabilitation/replanting. These could include (but are not limited to) mulching around plantings on shallow slopes, placement of geofabrics on steeper slopes and the use of rock protection.
- To reduce the potential for soil erosion, and enhance the aesthetics of the site, rehabilitate and replant disturbed areas as soon as possible after completion of the quarry works. Replanting should utilise native species, refer to Section 5.5.2.
- Prior to replanting activities, ameliorants such as fertilizer should be added to the soils. Fertiliser type and amount will be determined by the DTMR District Environment Officer in conjunction with the landowner, as per the department's guideline for the rehabilitation of gravel pits (DTMR 2007). Soils were generally deficient in carbon and nitrogen, and may also need to be lessened or tilled to increase root penetration potential.
- Stockpiles of top soil and other soils are to be managed to avoid erosion issues. Measures may include covering stockpiles or using sediment fences.
- Quarry material that is in trucks shall be secure and covered where feasible;
- All machinery and equipment is to be in good working order, with no leaking fuel or oil and no faulty hydraulic parts.
- Develop and implement emergency control procedures for significant fuel and/or chemical spills that may occur. The procedures should include the supply and use of spill kits and the procedure for reporting incidents to the DERM.

5.4 Surface Hydrology Features

5.4.1 Potential Impacts

The majority of the potential impacts to water quality will occur during the operational phase of the quarry pits. Although there are no watercourses or drainage lines that are directly impacted by the proposed quarry works and pit design enables the containment of sediments and contaminants, erosion and sedimentation and potential pollution issues are possible in surrounding watercourse and drainage lines as runoff will still occur. Potential impacts that may occur include:

- Pollution of the watercourses through accidental spills or leakages of contaminants from machinery operating at the proposed quarry site (for example oil, hydrocarbons and heavy metals);
- Pollution from general waste debris or rubbish that may be onsite (including felled vegetation, domestic refuse and specific construction waste); and
- Erosion and sedimentation pollution as a result of the direct quarry works from both runoff and wind.

The effect of these pollutants on the hydrological systems of the area will vary according to the intensity and type of contaminant, duration of release, dispersal of contaminants during rainfall events and mitigation measures employed during construction. The potential effects from pollutants include that heavy metals and general waste can harm aquatic ecosystems and biota. Furthermore suspended sediments from erosion reduce the clarity of waters and may cause siltation of downstream waterways.

5.4.2 Mitigation Measures

- All machinery and equipment is to be in good working order, with no leaking fuel or oil and no faulty hydraulic parts.
- Only emergency repairs to machinery should be undertaken on site to ensure safe working conditions, otherwise machinery should be removed and repaired off site.
- Store, handle, use and transport fuels and chemicals in accordance with their Material Safety Data Sheet (MSDS). Develop and implement emergency control procedures for significant fuel and/or chemical spills that may occur. The procedures should include the supply and use of spill kits and the procedure for reporting incidents to the DERM.
- Gravel pits are to be operated in accordance with the DTMR Gravel Pit Guideline (Department of Main Roads 2007). The Guideline includes incorporating drainage features at the base of the pit to contain sediment and other potential contaminants.
- Undertake visual monitoring during operation for hydrocarbons, rubbish and/or sediment plumes in watercourse and drainage lines.
- Where feasible, minimise quarry operations during heavy rain periods.
- Minimise the area of disturbance for all activities and ensure that the disturbance area is clearly defined.
- Implement procedures for appropriate waste management.
- Erosion and sediment control measures are to be implemented in accordance with Section 5.3 and any subsequent plans developed for the project.
- Permanent erosion control measures are to be incorporated as part of the post-construction rehabilitation/replanting. These could include (but are not limited to) mulching around plantings on shallow slopes, placement of geofabrics on steeper slopes and the use of rock protection.
- To reduce the potential for soil erosion, and enhance the aesthetics of the site, rehabilitate and replant disturbed areas as soon as possible after completion of the quarry works refer to Section 5.5.2.

5.5 Flora and Vegetation Communities

5.5.1 Potential Impacts

The Undara Gravel Resource Area did not contain any threatened species, the REs mapped for this area are all not of concern, and no essential habitat has been mapped over the site. The woodland on the granite rises has a higher species diversity than that of the surrounding areas, and has a relatively higher habitat value. The granite rises do not contain granite deco and are not the intended target of the extraction (and so will not be directly damaged). The narrow leaved ironbark, red bloodwood and Darwin woollybutt woodland found on the plains in the gravel resource area is characteristic of very large areas of woodland located across the Einasleigh Uplands. The entire area was relatively free of weeds, with only occasional individual rubber vine plants observed (less than one plant per hectare).

Potential impacts on the vegetation and flora communities in the study area are:

- Loss of a maximum of approximately nine hectares (each pit will be up to 1.5 ha in size, and there will be no more than four pits) of the not of concern RE 9.12.3. This RE is a common vegetation community in the Einasleigh Uplands bioregion (as indicated by it's not of concern status).
- Loss of large old trees, which cannot be readily replaced (such trees provide hollows, dead wood and logs, and as examples of successful individuals are important contributors to genetic diversity).
- Loss of site genetic continuity.
- Introduction of declared or environmental weeds by earthmoving machinery and vehicles.
- Loss of the vegetated matrix surrounding the granite rises, with possible impacts on recruitment.
- Loss of vegetation has a moderate potential to increase soil susceptibility to erosion.

Impacts on the vegetation in its role as habitat are discussed below.

5.5.2 Mitigation Measures

- Vegetation to be cleared should be clearly defined on maps and plans and the clearing limits clearly marked on the ground, for example by flagging.
- Areas from which deco is to be extracted should be cleared immediately before extraction (or as close the intended start date as is feasible – preferably not weeks or months beforehand).
- Areas cleared should be rehabilitated as soon as possible after the extraction of the resource has been completed, using a grass seed mix as identified in the DTMR Gravel Pit Guideline (Department of Main Roads 2007). Top soil should be stockpiled in an appropriate manner to assist in this process.
- Consider retaining large canopy trees of narrow leaved ironbark, red bloodwood, broad leaved carbeen and Darwin woollybutt, leaving soil intact at least to the drip line and preferably the drip line + 5 m. This will ensure that some structure is retained in the rehabilitation plantings, and that site genetic continuity is at least partially ensured into the future.
- Cleared trees should not be removed from site. Where possible smaller vegetative material (for example < 10 cm in diameter) can be mulched and utilised in rehabilitation. Larger diameter logs and branches (suitably delimbed) should be stockpiled and returned to the rehabilitated site to provide shelter for ground dwelling animals.

- Minimise the risk of weed species spreading and introduction of new weed species by:
  - Minimising the area of disturbance;
  - Controlling the spread of the existing weeds by destroying declared plants;
  - If fill is to be introduced onto the site, the fill is to be sourced from sites that are free from weed contamination; and
  - All equipment should be washed down before entering (there is a washdown facility at Mt Surprise) and leaving the site.
- Monitor rehabilitation success post planting to assess the need for weed control, erosion control or the replacement of dead trees, and address any problems identified during the monitoring.
- A sediment and erosion management plan should be prepared before clearing occurs, and the site should be stabilised in accordance with the plan as soon as possible after clearing occurs, and for the duration of time that cleared sites are denuded.

5.6 Fauna and Habitat Integrity

5.6.1 Potential Impacts

The Undara Gravel Resource Area displays a number of habitat resources, including tree hollows, termite mounds, boulder piles on granite rises (that will not be utilised for resource extraction), nectar from shrubs such as bushman's clothes pegs, fruit from trees and shrubs (primarily on the granite rises) and logs and other dead wood. The seeds of the Darwin woollybutt, a common species in the study area, were also observed to provide an important source of food for flocks of red-tailed black cockatoos. However, all of these resources are also present over large areas of surrounding woodland.

The expected impacts of the project on fauna and habitat integrity are:

- Low potential for injury and death to fauna from the clearing process.
- Loss of hollow-bearing trees, old hollow logs and branches that take many decades to develop.
- Loss of approximately 6 ha of eucalypt woodland habitat and the feeding resources contained therein, in particular areas foraged by red-tailed black cockatoos for Darwin woollybutt seed.
- Disturbance to breeding cycles of displaced fauna.

5.6.2 Mitigation Measures

- Engage a wildlife spotter during the clearing phase of the project to rescue and remove any wildlife that may be present, and to attend to injured wildlife humanely. The spotter should ideally arrive on site before clearing is to occur so a full reconnaissance of the site for fauna and nests can occur.
- Consider retaining large or hollow-bearing trees as outlined in the Flora section above, as these individuals take many decades to develop and often have very high utility for fauna.
- Trees containing breeding (nesting) birds will be retained, or the nest will be relocated by the wildlife spotter.
- Stockpile logs, dead wood and cleared trees (suitably delimbed) for redistribution over areas to be rehabilitated.

- Granite rises should be left untouched, and machinery, vehicles and equipment should not be parked or kept in these areas. The granite nolls are buffered out of the resource area (refer to Figure 1).
- Speed limits on site should be assigned to minimise animal collisions.
- Undertake rehabilitation as soon as possible after completion of the quarry works to restore the habitat values of the site.

5.7 Noise, Dust and Air Quality

5.7.1 Potential Impacts

Preparation, operation and rehabilitation works will increase the level of local noise, however there are no noise sensitive receptors in close proximity to the study area. Noise will arise from the use of heavy vehicles and earth moving equipment, and excavator operations and other major activities may be intrusive to users of Undara Road. The potential noise impacts will be restricted to working hours (daylight) and will cease once the site has been rehabilitated.

Dust is an issue that may be associated with the operational phase. The main function of the quarry pit means that there will be extensive earthworks. Due to the relatively dry climate of the area and the potential for strong winds, dust issues are likely to occur both on site (from quarry operations and stockpiles of soils), and if truck loads of materials are not adequately managed. There are no sensitive receptors (i.e. residences) within close proximity to the proposed quarry site, however due to the conditions onsite, dust has the potential to travel large distances and affect other sensitive receptors in the wider surrounding area.

Air quality may also be affected by vehicle and machinery exhaust fumes. Exhaust fume impacts are expected to be minor and limited to the proposed quarry site and immediate surrounding area. As the surrounding area is void of sensitive receptors, the likelihood of impact is low. Nevertheless, mitigation measures should be considered.

5.7.2 Mitigation Measures

- Where possible all vehicles and machinery used for the proposed works should be fitted with exhaust and silencer systems that are maintained in good working condition.
- Works will be in accordance with scheduled timeframes, 6 am to 6 pm as dictated by contract timeframes, Monday to Saturday inclusive.
- Regularly monitor quarry works to ensure that there is minimal dust generated. If large dust plumes are noticed mitigation measures should be put in place, for example altering work practices to avoid wind exposure or undertaking selected watering.
- Any stockpiled soils are to be maintained to ensure dust generation is limited, for example by selected water or covering the stockpiles with suitable material. Similarly any truck loads of materials should be covered.

5.8 Land Use and Traffic Issues

5.8.1 Potential Impacts

The current land use of the study area is grazing (some quarrying or earthworks were underway at the time of the field investigation in the area immediately adjacent to Undara Road). The nature of the proposed works means that there will be direct impacts on the nature of the site.

The proposed quarry works will have limited impacts upon the surrounding road network, namely the Gulf Developmental Road and Undara Road, as the quarry site is situated at a distance from the roads. Impacts are to be restricted to traffic, truck and machinery movement associated with accessing the proposed quarry site and transporting the quarry material. An increase in traffic in the area as a result of the quarry works has the potential to increase the likelihood of traffic accidents.

5.8.2 Mitigation Measures

- Site rehabilitation should occur as soon as possible after the quarry works cease, to restore the site to its pre-extraction condition to the greatest extent practical.
- Any truck, traffic or machinery movements on the roads are to comply with the road traffic rules of the area.

5.9 Visual Amenity

5.9.1 Potential Impacts

With any quarry pit operation there is a level of visual impact associated with the operation. The main impact will be the operation of the quarry pit itself. Impacts upon visual amenity may arise from the earthworks, storage of vehicles and machinery on site, general waste issues, and vegetation clearance. There are no sensitive receptors that are likely to experience visual amenity impacts. However, Undara Road users may be able to view the proposed quarry site and its operations resulting in a loss of visual amenity on the drive to Undara National Park.

Visual amenity impacts are expected to be limited to the operational phase of the proposed quarry. Loss of vegetation is expected to be limited to a defined area and the site is to be rehabilitated after works cease.

5.9.2 Mitigation Measures

- Implement procedures for site management to maintain a neat site during operation. Measures may include (but are not limited to):
  - Appropriate waste disposal measures such as supplying and organising the removal of bins;
  - Only store necessary vehicles and machinery onsite, ensure that they are within the designated works area; and
  - General management of quarry operations, such as stockpile locations to ensure limited impact to road users.
- To limit adverse visual amenity issues quarry pits are to be situated at least 75 m distant from the road.

- Undertake visual observations of the operations to ensure that there are no unnecessary visual amenity impacts.
- Rehabilitate any areas disturbed outside of the works area to improve the immediate amenity of the area.
- Undertake rehabilitation of the site as soon as practical after works cease.

6. Summary of Issues

6.1 Overall Statement of Project Impacts

The overall environmental impacts of the proposed quarry site are of a minor level. The majority of the impacts are restricted to the operational phase of the quarry, and provided that the site is appropriately managed and rehabilitated the impacts will be temporary.

The primary impacts are on flora and fauna habitat values, and erosion and sedimentation issues. Flora and fauna habitat impacts are unavoidable as the nature of the quarry operations require that the site is cleared. As a result there will be a loss of some 'not of concern' remnant vegetation. Although no threatened flora or fauna species were identified, the area is habitat to smaller terrestrial and bird species. Habitat for these species will potentially be impacted, but if the rolling granite rises are not disturbed, and rehabilitation is undertaken after extraction ceases in accordance with recommendations made in this report, impacts will be limited.

Due to the extensive earthworks associated with quarry operations, erosion issues are likely. The current landscape shows evidence of severe erosion, which may be exacerbated by the proposed quarry operations. Overall, project impacts can be minimised by:

- Utilising the DTMR Gravel Pit Guideline (Department of Main Roads 2007);
- Design, implementation and monitoring of an effective site-specific erosion and sediment control plan, to be accompanied by rehabilitation of disturbed areas with a grass seed mix;
- Restricting vegetation clearing to the area absolutely necessary for construction works, and retaining significant large or hollows-bearing trees;
- Rehabilitating cleared areas after extraction activities have ceased; and
- Implement measures to avoid fauna injuries, e.g. use a wildlife spotter.

6.2 Requirements for Approvals

The complete justification of the approvals and applicable legislation is included in Section 2. Due to the existing quarry licence issued under the *Forestry Act 1959*, an ERA applications is not required. This licence means clearing is a specified activity under the IPA, and consequently a vegetation clearing permit (under the VMA) is not required. In addition, because the activity is authorised under another Act (the Forestry Act), clearing of protected plants (listed under the NCA) by DTMR can also be conducted without a permit.

6.2.1 EPBC Referral

Based on the assessment detailed in this report, the proposed quarry works at the Undara Resource Area does not constitute a controlled action that may involve a likely significant impact on a matter of national environmental significance. Accordingly, it is considered that the project need not be referred to the Commonwealth Environment Minister.

6.2.2 Native Title and Aboriginal Cultural Heritage

It is understood that the DTMR are undertaking an internal Native Title and cultural heritage assessment as per the Gravel Pit Guideline (Department of Main Roads 2007). The outcomes from the assessment are to be incorporated during construction and operation.

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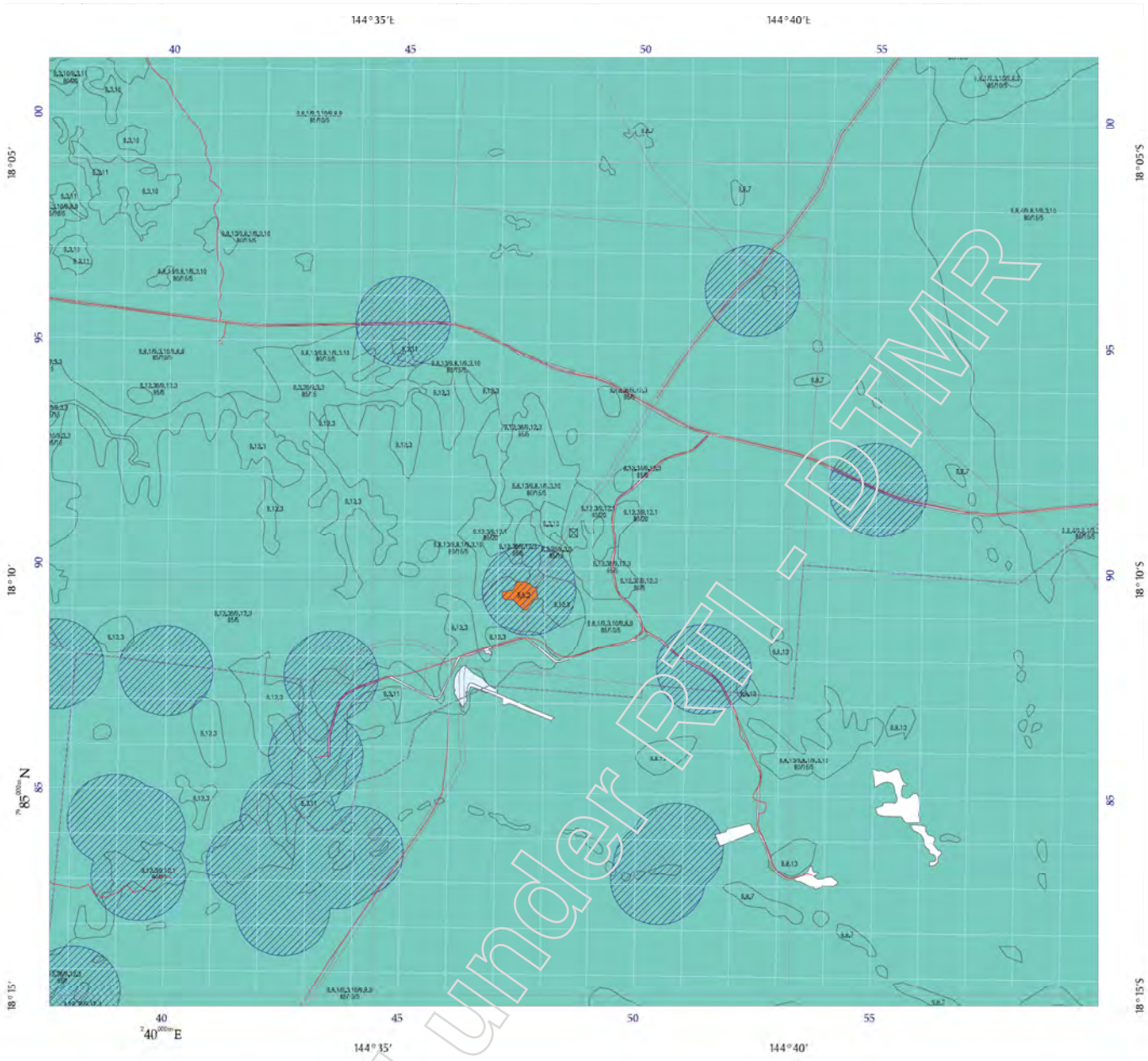
Appendix A

Database Search Results

DERM Remnant Vegetation Mapping

DEWHA Protected Matters Search Tool, EPBC Act

DERM Wildlife Online



2003 REGIONAL ECOSYSTEM MAP

Based on 2003 Landsat TM imagery

Requested By: BRONWYN.HOOKEY@GHD.COM.AU
Date: 23 Sep 09 Time: 16.55.48

Centered on point position:
Latitude: -18.1571 Longitude: 144.6236 (decimal degrees)

This is a copy of the certified regional ecosystem map defined by the map extent for the purpose of the *Vegetation Management Act 1999*. Areas of property maps of assessable vegetation (PMAVs) are not shown on this map.

- 2003 Remnant endangered regional ecosystem
  - Dominant
  - Sub-dominant
- 2003 Remnant of concern regional ecosystem
  - Dominant
  - Sub-dominant
- 2003 Remnant not of concern regional ecosystem
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- 2003 Remnant Vegetation Cover (RVC)
- Vegetation Management Act Essential Habitat
  Area identified as essential habitat by the EPA for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*.
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Certified Map Amendment area
- Roads
  © MapInfo Australia Pty Ltd 2008
- Bioregion boundary
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM

2000 0 2000 m

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.epa.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

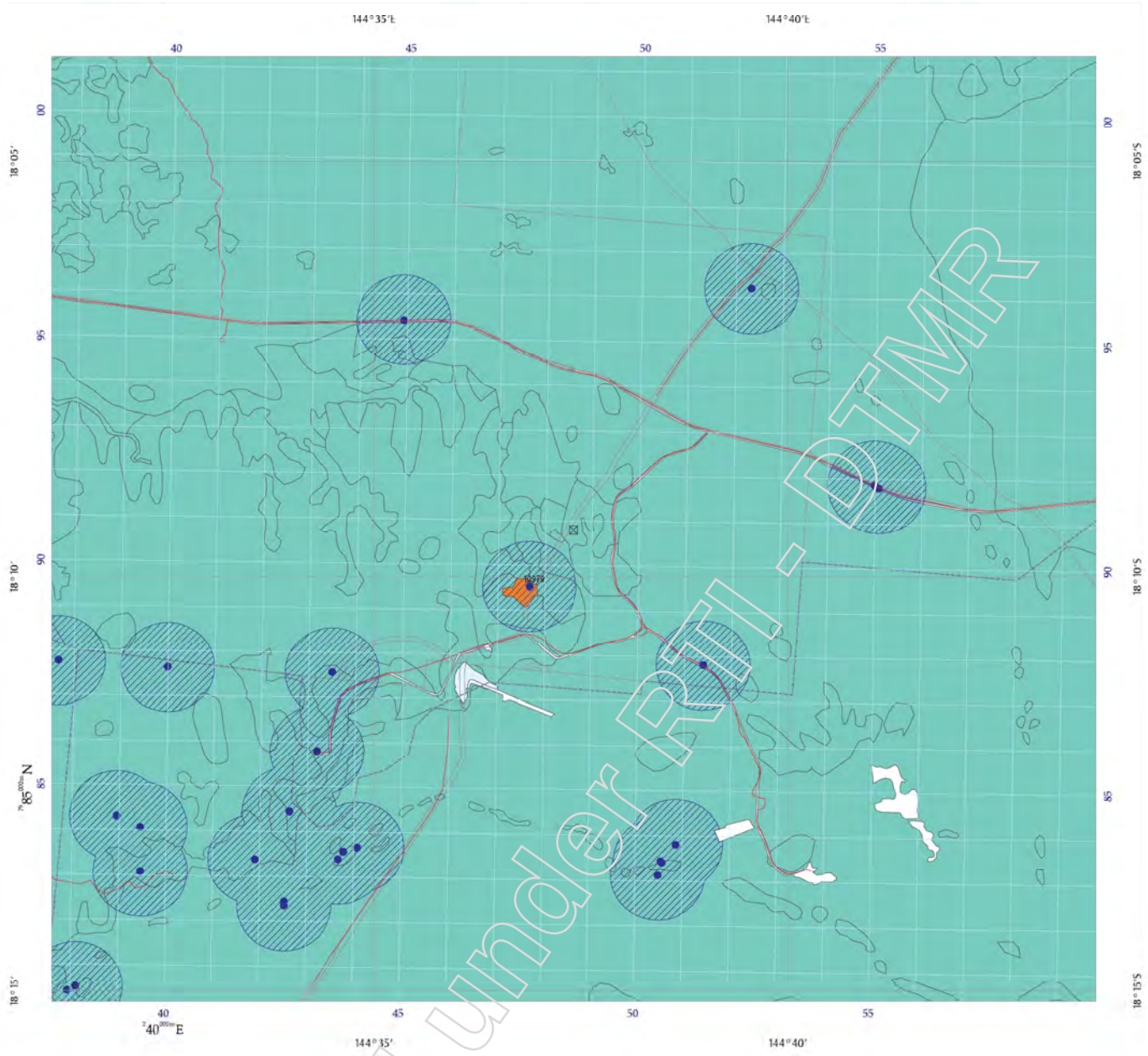
Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2003, depicted on this map is based on rectified 2003 Landsat TM imagery (supplied by SLATS, Department of Natural Reources and Water).

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Water, the Environmental Protection Agency and MapInfo Australia Pty Ltd, makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.nrw.qld.gov.au/vegetation or contact the Department of Natural Resources and Water.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.epa.qld.gov.au/REDATA or from the Queensland Herbarium for larger areas.
Email: regional.ecosystem@epa.qld.gov.au



VEGETATION MANAGEMENT ACT ESSENTIAL HABITAT MAP

Requested By: BRONWYN.HOOKEY@GHD.COM.AU
Date: 23 Sep 09 Time: 16.55.50

Centered on point position:
Latitude: -18.1571 Longitude: 144.6236 (decimal degrees)

- 2003 Remnant endangered regional ecosystem
  - Dominant
  - Sub-dominant
- 2003 Remnant of concern regional ecosystem
  - Dominant
  - Sub-dominant
- 2003 Remnant not of concern regional ecosystem
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- 2003 Remnant Vegetation Cover (RVC)
- Vegetation Management Act Essential Habitat
  Area identified as essential habitat by the EPA for a species of wildlife listed as endangered, vulnerable, near threatened or rare under the *Nature Conservation Act 1992*.
- Vegetation Management Act Essential Habitat Species Records
- Roads
  © MapInfo Australia Pty Ltd 2006
- Bioregion boundary
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  The maximum spatial error of parcels extracted for this map from the Digital Cadastral Data Base(DCDB) range from: 14m to 251m at a 95% confidence level. Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM

2000 0 2000 m

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Labels for Vegetation Management Act Essential Habitat are centred on the area of interest (1.1km surrounding and including a Lot on Plan or 2.2km around the selected coordinates). Labels relate to the attached species list.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2003, depicted on this map is based on rectified 2003 Landsat TM imagery (supplied by SLATS, Department of Natural Reources and Water).

Disclaimer:
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All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.nrw.qld.gov.au/vegetation or contact the Department of Natural Resources and Water.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.epa.qld.gov.au/REDATA or from the Queensland Herbarium for larger areas.
Email: regional.ecosystem@epa.qld.gov.au

Australian Government
Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

29 September 2009 09:13

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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. 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

Search Type: Point
Buffer: 20 km
Coordinates: -18.157141,144.62364

Report Contents:

Summary

Matters of National Environmental 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 Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None

Threatened Species:	9
Migratory Species:	13

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.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	1
Listed Marine Species:	13
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 nominated.

State and Territory Reserves:	1
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern)	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll	Endangered	Species or species habitat may occur within area

Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat	Endangered	Species or species habitat may occur within area
Pteropus conspicillatus Spectacled Flying-fox	Vulnerable	Species or species habitat may occur within area
Rhinolophus philippinensis (large form) Greater Large-eared Horseshoe Bat	Endangered	Species or species habitat may occur within area
Reptiles		
Egernia rugosa Yakka Skink	Vulnerable	Species or species habitat likely to occur within area
Sharks		
Pristis microdon Freshwater Sawfish	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Migratory Marine Species		
Reptiles		
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Migratory	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area

Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Species or species habitat likely to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile	Listed	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Listed	Species or species habitat likely to occur within area

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Undara Lava System QLD

Extra Information

State and Territory Reserves [Dataset Information]

Undara Volcanic National Park, QLD

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 resolutions.

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 information sources.

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 migratory and marine provisions of the Act have been mapped.

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.

Acknowledgments

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
- Other groups and individuals

ANUClIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: 18.157141
Longitude: 144.62364
Distance: 20
Email [redacted]@ghd.com.au
Date submitted: Tuesday 29 Sep 2009 09:33:45
Date extracted: Tuesday 29 Sep 2009 09:46:07

The number of records retrieved = 845

Disclaimer

As the EPA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	*Rhinella marina*	cane toad	Y			31
animals	amphibians	Hylidae	*Cyclorana sp.*					2
animals	amphibians	Hylidae	*Litoria nasuta*	striped rocketfrog		C		12
animals	amphibians	Hylidae	*Litoria inermis*	bumpy rocketfrog		C		32/12
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		5
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		29
animals	amphibians	Hylidae	*Cyclorana novaehollandiae*	eastern snapping frog		C		31/1
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		14
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		31
animals	amphibians	Limnodynastidae	*Platyplectrum ornatum*	ornate burrowing frog		C		7
animals	amphibians	Limnodynastidae	*Limnodynastes tasmaniensis*	spotted grassfrog		C		20
animals	amphibians	Limnodynastidae	*Limnodynastes terraereginae*	scarlet sided pobblebonk		C		8/1
animals	amphibians	Myobatrachidae	*Uperoleia lithomoda*	stonemason gungan		C		22
animals	amphibians	Myobatrachidae	*Crinia deserticola*	chirping froglet		C		6/2
animals	amphibians	Myobatrachidae	*Uperoleia littlejohni*	Einasleigh gungan		C		13
animals	birds	Acanthizidae	*Acanthiza nana*	yellow thornbill		C		1
animals	birds	Acanthizidae	*Acanthiza reguloides*	buff-rumped thornbill		C		1
animals	birds	Acanthizidae	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		C		1
animals	birds	Acanthizidae	*Smicrornis brevirostris*	weebill		C		21
animals	birds	Acanthizidae	*Gerygone albogularis*	white-throated gerygone		C		10
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		10
animals	birds	Accipitridae	*Accipiter fasciatus*	brown goshawk		C		3
animals	birds	Accipitridae	*Aviceda subcristata*	Pacific baza		C		1
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		11
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		5
animals	birds	Accipitridae	*Hamirostra melanosternon*	black-breasted buzzard		C		1
animals	birds	Accipitridae	*Accipiter novaehollandiae*	grey goshawk		R		2
animals	birds	Accipitridae	*Hieraaetus morphnoides*	little eagle		C		1
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		2
animals	birds	Anatidae	*Aythya australis*	hardhead		C		1
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		6
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		C		5
animals	birds	Ardeidae	*Ardea modesta*	eastern great egret		C		2
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		1
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		4
animals	birds	Ardeidae	*Nycticorax caledonicus*	Nankeen night-heron		C		1
animals	birds	Ardeidae	*Ardea pacifica*	white-necked heron		C		4
animals	birds	Artamidae	*Artamus minor*	little woodswallow		C		1
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		1
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		60
animals	birds	Artamidae	*Strepera graculina*	pied currawong		C		35/1
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		46
animals	birds	Artamidae	*Cracticus torquatus*	grey butcherbird		C		9
animals	birds	Burhinidae	*Burhinus grallarius*	bush stone-curlew		C		3
animals	birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo		C		7

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Cacatuidae	*Calyptorhynchus banksii*	red-tailed black-cockatoo		C		30
animals	birds	Cacatuidae	*Eolophus roseicapillus*	galah		C		26
animals	birds	Campephagidae	*Lalage sueurii*	white-winged triller		C		2
animals	birds	Campephagidae	*Lalage leucomela*	varied triller		C		3
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		19
animals	birds	Campephagidae	*Coracina papuensis*	white-bellied cuckoo-shrike		C		16
animals	birds	Casuariidae	*Dromaius novaehollandiae*	emu		C		1
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		4
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		R		1
animals	birds	Climacteridae	*Climacteris picumnus*	brown treecreeper		C		1
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		16
animals	birds	Columbidae	*Geophaps scripta*	squatter pigeon		C		11
animals	birds	Columbidae	*Phaps chalcoptera*	common bronzewing		C		7
animals	birds	Columbidae	*Geophaps scripta peninsulae*	squatter pigeon (northern subspecies)		C		1
animals	birds	Columbidae	*Macropygia amboinensis*	brown cuckoo-dove		C		1
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		2
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		9
animals	birds	Coraciidae	*Eurystomus orientalis*	dollarbird		C		7
animals	birds	Corcoracidae	*Struthidea cinerea*	apostlebird		C		7
animals	birds	Corvidae	*Corvus sp.*					3
animals	birds	Corvidae	*Corvus coronoides*	Australian raven		C		19
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		31
animals	birds	Cuculidae	*Chalcites basalis*	Horsfield's bronze-cuckoo		C		2
animals	birds	Cuculidae	*Chalcites osculans*	black-eared cuckoo		C		1
animals	birds	Cuculidae	*Eudynamys orientalis*	eastern koel		C		6
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		6
animals	birds	Cuculidae	*Scythrops novaehollandiae*	channel-billed cuckoo		C		7
animals	birds	Cuculidae	*Cacomantis variolosus*	brush cuckoo		C		1
animals	birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo		C		1
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		1
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		9
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		4
animals	birds	Falconidae	*Falco peregrinus*	peregrine falcon		C		3
animals	birds	Falconidae	*Falco longipennis*	Australian hobby		C		2
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		10
animals	birds	Gruidae	*Grus rubicunda*	brolga		C		6
animals	birds	Halcyonidae	*Dacelo leachii*	blue-winged kookaburra		C		13
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		5
animals	birds	Halcyonidae	*Todiramphus sanctus*	sacred kingfisher		C		2
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		38
animals	birds	Hirundinidae	*Petrochelidon nigricans*	tree martin		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		1
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		3
animals	birds	Meliphagidae	*Myzomela obscura*	dusky honeyeater		C		1
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		31
animals	birds	Meliphagidae	*Lichenostomus fuscus*	fuscous honeyeater		C		3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater		R		1
animals	birds	Meliphagidae	*Melithreptus albogularis*	white-throated honeyeater		C		27
animals	birds	Meliphagidae	*Lichenostomus flavescens*	yellow-tinted honeyeater		C		3
animals	birds	Meliphagidae	*Lichenostomus virescens*	singing honeyeater		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		21
animals	birds	Meliphagidae	*Myzomela sanguinolenta*	scarlet honeyeater		C		2
animals	birds	Meliphagidae	*Manorina melanocephala*	noisy miner		C		32/1
animals	birds	Meliphagidae	*Lichenostomus unicolor*	white-gaped honeyeater		C		2
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		35
animals	birds	Meliphagidae	*Philemon argenticeps*	silver-crowned friarbird		C		1
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		19
animals	birds	Meliphagidae	*Manorina flavigula*	yellow-throated miner		C		7
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		9
animals	birds	Meropidae	*Merops ornatus*	rainbow bee-eater		C		14
animals	birds	Monarchidae	*Myiagra inquieta*	restless flycatcher		C		2
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		7
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		18
animals	birds	Monarchidae	*Myiagra cyanoleuca*	satin flycatcher		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		11
animals	birds	Neosittidae	*Daphoenositta chrysoptera*	varied sittella		C		1
animals	birds	Oriolidae	*Oriolus sagittatus*	olive-backed oriole		C		5
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		2
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		3
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		2
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		21
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		36
animals	birds	Pardalotidae	*Pardalotus rubricatus*	red-browed pardalote		C		1
animals	birds	Pardalotidae	*Pardalotus punctatus*	spotted pardalote		C		3/1
animals	birds	Petroicidae	*Microeca fascinans*	jacky winter		C		4
animals	birds	Petroicidae	*Microeca flavigaster*	lemon-bellied flycatcher		C		5
animals	birds	Phasianidae	*Coturnix pectoralis*	stubble quail		C		1
animals	birds	Phasianidae	*Coturnix ypsilophora*	brown quail		C		1
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		7
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		3
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		3
animals	birds	Psittacidae	*Platycercus eximius*	eastern rosella		C		2/2
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		25
animals	birds	Psittacidae	*Platycercus adscitus adscitus*	pale-headed rosella (northern form)		C		15
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		39
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		2
animals	birds	Psittacidae	*Trichoglossus haematodus moluccanus*	rainbow lorikeet		C		43
animals	birds	Ptilonorhynchidae	*Ptilonorhynchus nuchalis*	great bowerbird		C		11
animals	birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail		C		19
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		12
animals	birds	Scolopacidae	*Tringa glareola*	wood sandpiper		C		2
animals	birds	Strigidae	*Ninox boobook*	southern boobook		C		16

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Sturnidae	*Sturnus tristis*	common myna	Y			1
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		5
animals	birds	Timaliidae	*Zosterops lateralis*	silvereye		C		1
animals	bony fish	Eleotridae	*Mogurnda mogurnda*	northern purplespotted gudgeon				1
animals	bony fish	Melanotaeniidae	*Melanotaenia splendida splendida*	eastern rainbowfish				1
animals	mammals	Canidae	*Canis lupus dingo*	dingo				5
animals	mammals	Dasyuridae	*Dasyurus hallucatus*	northern quoll		C	E	1
animals	mammals	Emballonuridae	*Taphozous georgianus*	common sheathtail bat		C		1
animals	mammals	Equidae	*Equus caballus*	horse	Y			1
animals	mammals	Felidae	*Felis catus*	cat	Y			1
animals	mammals	Hipposideridae	*Hipposideros diadema reginae*	diadem leaf-nosed bat		R		2
animals	mammals	Leporidae	*Oryctolagus cuniculus*	rabbit	Y			7
animals	mammals	Macropodidae	*Macropus giganteus*	eastern grey kangaroo		C		12
animals	mammals	Macropodidae	*Petrogale mareeba*	Mareeba rock-wallaby		R		11
animals	mammals	Macropodidae	*Macropus robustus*	common wallaroo		C		25
animals	mammals	Macropodidae	*Macropus dorsalis*	black-striped wallaby		C		3
animals	mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby		C		1
animals	mammals	Macropodidae	*Macropus parryi*	whiptail wallaby		C		6
animals	mammals	Macropodidae	*Petrogale assimilis*	allied rock-wallaby		C		1
animals	mammals	Macropodidae	*Macropus antilopinus*	antilopine wallaroo		C		7
animals	mammals	Megadermatidae	*Macroderma gigas*	ghost bat		V		1
animals	mammals	Muridae	*Mus musculus*	house mouse	Y			2
animals	mammals	Muridae	*Rattus rattus*	black rat	Y			1/1
animals	mammals	Muridae	*Rattus lutreolus*	swamp rat		C		1
animals	mammals	Muridae	*Pseudomys delicatulus*	delicate mouse		C		2/1
animals	mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot		C		2/1
animals	mammals	Petauridae	*Petaurus norfolcensis*	squirrel glider		C		1
animals	mammals	Phalangeridae	*Trichosurus vulpecula*	common brushtail possum		C		10
animals	mammals	Potoroidae	*Aepyprymnus rufescens*	rufous bettong		C		10
animals	mammals	Pseudocheiridae	*Petauroides volans*	greater glider		C		2
animals	mammals	Pteropodidae	*Pteropus scapulatus*	little red flying-fox		C		1
animals	mammals	Rhinolophidae	*Rhinolophus megaphyllus*	eastern horseshoe-bat		C		42/3
animals	mammals	Suidae	*Sus scrofa*	pig	Y			1
animals	mammals	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna		C		10
animals	mammals	Vespertilionidae	*Miniopterus sp.*					2
animals	mammals	Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat		C		25/5
animals	mammals	Vespertilionidae	*Miniopterus schreibersii oceanensis*	eastern bent-wing bat		C		35
animals	mammals	Vespertilionidae	*Miniopterus australis*	little bent-wing bat		C		34
animals	reptiles	Agamidae	*Pogona barbata*	bearded dragon		C		3
animals	reptiles	Agamidae	*Tympanocryptis sp.*					1
animals	reptiles	Agamidae	*Diporiphora australis*			C		3
animals	reptiles	Agamidae	*Chlamydosaurus kingii*	frilled lizard		C		6
animals	reptiles	Agamidae	*Diporiphora sp.*					1
animals	reptiles	Boidae	*Morelia spilota*	carpet python		C		6
animals	reptiles	Boidae	*Antaresia maculosa*			C		14
animals	reptiles	Boidae	*Aspidites melanocephalus*	black-headed python		C		5

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	reptiles	Chelidae	*Wollumbinia latisternum*	saw-shelled turtle		C		1
animals	reptiles	Colubridae	*Boiga irregularis*	brown tree snake		C		8
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		4
animals	reptiles	Colubridae	*Dendrelaphis punctulata*	common tree snake		C		3
animals	reptiles	Elapidae	*Suta suta*	myall snake		C		2
animals	reptiles	Elapidae	*Vermicella annulata*	bandy-bandy		C		1
animals	reptiles	Elapidae	*Acanthophis praelongus*	northern death adder		C		1
animals	reptiles	Elapidae	*Hoplocephalus bitorquatus*	pale-headed snake		C		1
animals	reptiles	Elapidae	*Acanthophis antarcticus*	common death adder		R		1
animals	reptiles	Elapidae	*Pseudechis australis*	king brown snake		C		1
animals	reptiles	Elapidae	*Pseudonaja textilis*	eastern brown snake		C		1
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1
animals	reptiles	Elapidae	*Demansia papuensis*	Papuan whip snake		C		1
animals	reptiles	Elapidae	*Pseudonaja nuchalis*	western brown snake		C		1
animals	reptiles	Elapidae	*Demansia vestigiata*	black whip snake		C		1
animals	reptiles	Gekkonidae	*Gehyra nana*			C		1
animals	reptiles	Gekkonidae	*Gehyra dubia*			C		6
animals	reptiles	Gekkonidae	*Nephrurus asper*	spiny knob-tailed gecko		C		4
animals	reptiles	Gekkonidae	*Heteronotia binoei*	Bynoe's gecko		C		8
animals	reptiles	Gekkonidae	*Oedura castelnaui*	northern velvet gecko		C		1
animals	reptiles	Gekkonidae	*Oedura rhombifer*	zig-zag gecko		C		5
animals	reptiles	Gekkonidae	*Oedura coggeri*	northern spotted velvet gecko		C		6
animals	reptiles	Gekkonidae	*Strophurus williamsi*	soft-spined gecko		C		1
animals	reptiles	Gekkonidae	*Diplodactylus conspicillatus*	fat-tailed diplodactylus		C		1
animals	reptiles	Gekkonidae	*Lucasium steindachneri*	Steindachner's gecko		C		1
animals	reptiles	Pygopodidae	*Lialis burtonis*	Burton's legless lizard		C		2
animals	reptiles	Scincidae	*Carlia munda*			C		9
animals	reptiles	Scincidae	*Lerista ameles*			R		5/2
animals	reptiles	Scincidae	*Anomalopus gowi*			C		2/1
animals	reptiles	Scincidae	*Carlia jarnoldae*			C		9
animals	reptiles	Scincidae	*Lerista zonulata*			C		3
animals	reptiles	Scincidae	*Bellatorias frerei*	major skink		C		1
animals	reptiles	Scincidae	*Ctenotus spaldingi*			C		8
animals	reptiles	Scincidae	*Notoscincus ornatus*			C		1
animals	reptiles	Scincidae	*Cryptobiepharus pannosus*	ragged snake-eyed skink		C		2
animals	reptiles	Scincidae	*Glaphyromorphus cracens*			C		2
animals	reptiles	Scincidae	*Morethia taeniopleura*	fire-tailed skink		C		2
animals	reptiles	Scincidae	*Proablepharus tenuis*			C		3
animals	reptiles	Scincidae	*Eulamprus brachysoma*			C		1
animals	reptiles	Scincidae	*Ctenotus taeniolatus*	copper-tailed skink		C		4
animals	reptiles	Scincidae	*Ctenotus essingtonii*			C		3
animals	reptiles	Scincidae	*Tiliqua scincoides*	eastern blue-tongued lizard		C		2
animals	reptiles	Scincidae	*Carlia mundivensis*			C		11
animals	reptiles	Scincidae	*Carlia schmeltzii*			C		4
animals	reptiles	Scincidae	*Eulamprus tenuis*			C		6
animals	reptiles	Scincidae	*Menetia timlowi*			C		2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	reptiles	Scincidae	*Carlia rococo*			R		4
animals	reptiles	Varanidae	*Varanus storri*	Storr's monitor		C		1
animals	reptiles	Varanidae	*Varanus varius*	lace monitor		C		1
fungi	sac fungi	Collemataceae	*Collema*			C		1/1
fungi	sac fungi	Lobariaceae	*Pseudocyphellaria aurata*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema crinitum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema robustum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema reticulatum*			C		1/1
fungi	sac fungi	Parmeliaceae	*Flavoparmelia euplecta*			C		1/1
fungi	sac fungi	Parmeliaceae	*Parmotrema tinctorum*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia obscurata*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia hypocaesia*			C		1/1
fungi	sac fungi	Physciaceae	*Dirinaria applanata*			C		1/1
fungi	sac fungi	Physciaceae	*Heterodermia speciosa*			C		1/1
fungi	sac fungi	Ramalinaceae	*Ramalina peruviana*			C		1/1
fungi	sac fungi	Teloschistaceae	*Teloschistes flavicans*			C		1/1
plants	ferns	Adiantaceae	*Cheilanthes brownii*			C		2/2
plants	ferns	Adiantaceae	*Pityrogramma calomelanos var. calomelanos*		Y			1/1
plants	ferns	Adiantaceae	*Paraceterach muelleri*			C		3/3
plants	ferns	Adiantaceae	*Cheilanthes nudiuscula*			C		2/2
plants	ferns	Adiantaceae	*Adiantum hispidulum var. minus*			C		1/1
plants	ferns	Adiantaceae	*Cheilanthes contigua*			C		1/1
plants	ferns	Davalliaceae	*Davallia denticulata var. denticulata*			C		1/1
plants	ferns	Nephrolepidaceae	*Nephrolepis cordifolia*	fishbone fern		C		1/1
plants	ferns	Polypodiaceae	*Drynaria rigidula*			C		1/1
plants	ferns	Polypodiaceae	*Pyrrosia rupestris*	rock felt fern		C		2/2
plants	ferns	Polypodiaceae	*Microsorum punctatum*			C		1/1
plants	ferns	Thelypteridaceae	*Macrothelypteris torresiana*	pale wood fern		C		1/1
plants	higher dicots	Acanthaceae	*Rostellularia*			C		1
plants	higher dicots	Acanthaceae	*Rostellularia adscendens subsp. glaucoviolacea*			C		1/1
plants	higher dicots	Acanthaceae	*Brunoniella acaulis subsp. acaulis*			C		1/1
plants	higher dicots	Acanthaceae	*Pseuderanthemum variabile*	pastel flower		C		3/3
plants	higher dicots	Acanthaceae	*Rostellularia adscendens*			C		5/3
plants	higher dicots	Acanthaceae	*Brunoniella australis*	blue trumpet		C		1/1
plants	higher dicots	Acanthaceae	*Brunoniella acaulis*			C		1
plants	higher dicots	Amaranthaceae	*Alternanthera nana*	hairy joyweed		C		2/2
plants	higher dicots	Amaranthaceae	*Deeringia amaranthoides*	redberry		C		2/2
plants	higher dicots	Amaranthaceae	*Amaranthus interruptus*			C		2/2
plants	higher dicots	Amaranthaceae	*Gomphrena flaccida*			C		1/1
plants	higher dicots	Anacardiaceae	*Pleiogynium timorense*	Burdekin plum		C		3/2
plants	higher dicots	Anacardiaceae	*Euroschinus falcatus var. angustifolius*			C		1/1
plants	higher dicots	Apiaceae	*Platysace valida*			C		1/1
plants	higher dicots	Apiaceae	*Eryngium plantagineum*	long eryngium		C		2/2
plants	higher dicots	Apocynaceae	*Carissa ovata*	currantbush		C		1/1
plants	higher dicots	Apocynaceae	*Cynanchum leptolepis*			C		3/3

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plants	higher dicots	Apocynaceae	*Cynanchum pedunculatum*			C		2/2
plants	higher dicots	Apocynaceae	*Marsdenia viridiflora subsp. tropica*			C		6/6
plants	higher dicots	Apocynaceae	*Sarcostemma viminale subsp. brunonianum*			C		1/1
plants	higher dicots	Apocynaceae	*Parsonsia plaesiophylla*			C		2/2
plants	higher dicots	Apocynaceae	*Parsonsia lanceolata*	northern silkpod		C		5/5
plants	higher dicots	Apocynaceae	*Wrightia versicolor*			C		3/3
plants	higher dicots	Apocynaceae	*Calotropis procera*		Y			2/2
plants	higher dicots	Apocynaceae	*Cascabela thevetia*	yellow oleander	Y			1/1
plants	higher dicots	Apocynaceae	*Secamone elliptica*			C		4/4
plants	higher dicots	Apocynaceae	*Wrightia saligna*			C		3/3
plants	higher dicots	Araliaceae	*Polyscias elegans*	celery wood		C		2/2
plants	higher dicots	Araliaceae	*Trachymene bivestita var. bivestita*			C		1/1
plants	higher dicots	Araliaceae	*Trachymene bivestita var. pterocarpa*			C		4/4
plants	higher dicots	Araliaceae	*Hydrocotyle acutiloba*			C		1/1
plants	higher dicots	Araliaceae	*Hydrocotyle grammatocarpa*			C		1/1
plants	higher dicots	Asteraceae	*Asteraceae*			C		2
plants	higher dicots	Asteraceae	*Camptacra gracilis*			C		3/3
plants	higher dicots	Asteraceae	*Conyza sumatrensis*	tall fleabane	Y			1/1
plants	higher dicots	Asteraceae	*Acmella grandiflora var. brachyglossa*			C		1/1
plants	higher dicots	Asteraceae	*Peripleura hispidula var. hispidula*			C		3/3
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		1/1
plants	higher dicots	Asteraceae	*Pterocaulon sphacelatum*	applebush		C		1/1
plants	higher dicots	Asteraceae	*Xerochrysum bracteatum*	golden everlasting daisy		C		2/2
plants	higher dicots	Asteraceae	*Wedelia spilanthoides*			C		3/3
plants	higher dicots	Asteraceae	*Cyanthillium cinereum*			C		7/4
plants	higher dicots	Asteraceae	*Xanthium occidentale*		Y			1/1
plants	higher dicots	Asteraceae	*Pterocaulon redolens*			C		2
plants	higher dicots	Asteraceae	*Wollastonia biflora*			C		1
plants	higher dicots	Asteraceae	*Praxelis clematidea*		Y			6/6
plants	higher dicots	Asteraceae	*Acmella grandiflora*			C		2
plants	higher dicots	Asteraceae	*Peripleura diffusa*			C		2/2
plants	higher dicots	Asteraceae	*Conyza bonariensis*		Y			1/1
plants	higher dicots	Asteraceae	*Tridax procumbens*	tridax daisy	Y			2/1
plants	higher dicots	Asteraceae	*Cassinia laevis*			C		1/1
plants	higher dicots	Asteraceae	*Bidens bipinnata*	bipinnate beggar's ticks	Y			2/1
plants	higher dicots	Asteraceae	*Sonchus oleraceus*	common sowthistle	Y			2/2
plants	higher dicots	Asteraceae	*Camptacra barbata*			C		11/11
plants	higher dicots	Asteraceae	*Tagetes minuta*	stinking roger	Y			1/1
plants	higher dicots	Bignoniaceae	*Pandorea pandorana*	wonga vine		C		4/4
plants	higher dicots	Bignoniaceae	*Dolichandrone heterophylla*			C		1/1
plants	higher dicots	Boraginaceae	*Cordia dichotoma*			C		3/3
plants	higher dicots	Boraginaceae	*Heliotropium consimile*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium brachygyne*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium peninsulare*			C		3/3
plants	higher dicots	Boraginaceae	*Heliotropium cunninghamii*			C		2/2
plants	higher dicots	Boraginaceae	*Trichodesma zeylanicum var. zeylanicum*			C		2/2

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plants	higher dicots	Boraginaceae	*Heliotropium tenuifolium*			C		1/1
plants	higher dicots	Boraginaceae	*Heliotropium pauciflorum*			C		1/1
plants	higher dicots	Boraginaceae	*Trichodesma zeylanicum*			C		2/2
plants	higher dicots	Boraginaceae	*Heliotropium indicum*		Y			1/1
plants	higher dicots	Boraginaceae	*Ehretia membranifolia*	weeping koda		C		1/1
plants	higher dicots	Burseraceae	*Canarium australianum var. australianum*			C		1/1
plants	higher dicots	Byttneriaceae	*Waltheria indica*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Cassia*			C		1
plants	higher dicots	Caesalpiniaceae	*Senna sophera var. (40Mile Scrub J.R.Clarkson+ 6908)*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista nomame var. nomame*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista exigua var. exigua*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista exigua var. minor*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Chamaecrista absus var. absus*			C		3/3
plants	higher dicots	Caesalpiniaceae	*Chamaecrista nomame*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Lysiphyllum hookeri*	Queensland ebony		C		2/2
plants	higher dicots	Caesalpiniaceae	*Chamaecrista mimosoides*	dwarf cassia		C		1/1
plants	higher dicots	Caesalpiniaceae	*Erythrophleum chlorostachys*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna sophera var. sophera*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna gaudichaudii*			C		2/2
plants	higher dicots	Caesalpiniaceae	*Tamarindus indica*		Y			1/1
plants	higher dicots	Campanulaceae	*Pratia concolor*	poison pratia		C		1/1
plants	higher dicots	Campanulaceae	*Lobelia quadrangularis*			C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia graniticola*	granite bluebell		C		1/1
plants	higher dicots	Campanulaceae	*Wahlenbergia communis*	tufted bluebell		C		1/1
plants	higher dicots	Campanulaceae	*Lobelia membranacea*			C		1/1
plants	higher dicots	Capparaceae	*Capparis*			C		1
plants	higher dicots	Capparaceae	*Capparis arborea*	brush caper berry		C		1/1
plants	higher dicots	Capparaceae	*Capparis canescens*			C		1/1
plants	higher dicots	Capparaceae	*Capparis shanesiana*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa*			C		3
plants	higher dicots	Caryophyllaceae	*Polycarpaea spirostylis*			C		2
plants	higher dicots	Caryophyllaceae	*Polycarpaea corymbosa var. corymbosa*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea spirostylis subsp. spirostylis*			C		1/1
plants	higher dicots	Caryophyllaceae	*Polycarpaea multicaulis*			C		1/1
plants	higher dicots	Celastraceae	*Denhamia oleaster*			C		2/2
plants	higher dicots	Celastraceae	*Maytenus cunninghamii*	yellow berry bush		C		4/1
plants	higher dicots	Celastraceae	*Denhamia pittosporoides subsp. angustifolia*			C		2/2
plants	higher dicots	Celastraceae	*Elaeodendron melanocarpum*			C		1/1
plants	higher dicots	Celastraceae	*Maytenus disperma*	orange boxwood		C		1/1
plants	higher dicots	Celastraceae	*Siphonodon australis*	ivorywood		C		2/2
plants	higher dicots	Cleomaceae	*Cleome gynandra*		Y			1/1
plants	higher dicots	Cleomaceae	*Cleome viscosa*	tick-weed		C		3/3
plants	higher dicots	Cleomaceae	*Cleome*			C		3/3
plants	higher dicots	Cleomaceae	*Cleome monophylla*		Y			3/3
plants	higher dicots	Cochlospermaceae	*Cochlospermum gregorii*			C		2/2

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plants	higher dicots	Cochlospermaceae	*Cochlospermum gillivraei*			C		2/1
plants	higher dicots	Combretaceae	*Terminalia aridicola*			C		1/1
plants	higher dicots	Combretaceae	*Terminalia aridicola subsp. chillagoensis*			C		2/2
plants	higher dicots	Combretaceae	*Terminalia aridicola subsp. aridicola*			C		1/1
plants	higher dicots	Convolvulaceae	*Polymeria*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea polpha*			C		3/2
plants	higher dicots	Convolvulaceae	*Ipomoea plebeia*	bellvine		C		5/5
plants	higher dicots	Convolvulaceae	*Ipomoea eriocarpa*			C		5/3
plants	higher dicots	Convolvulaceae	*Ipomoea polymorpha*			C		3/2
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides*			C		1
plants	higher dicots	Convolvulaceae	*Xenostegia tridentata*			C		2/2
plants	higher dicots	Convolvulaceae	*Polymeria sp. (Chillagoe K.R.McDonald KRM328)*			C		2/2
plants	higher dicots	Convolvulaceae	*Jacquemontia sp. (Fairview R.W.Johnson 4026)*			C		2/2
plants	higher dicots	Convolvulaceae	*Evolvulus alsinoides var. sericeus*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea gracilis var. sagittata*			C		6/6
plants	higher dicots	Convolvulaceae	*Ipomoea polpha subsp. polpha*			C		5/5
plants	higher dicots	Convolvulaceae	*Ipomoea saintronanensis*			R		5/5
plants	higher dicots	Convolvulaceae	*Polymeria longifolia*	polymeria		C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea argillicola*			C		8/8
plants	higher dicots	Convolvulaceae	*Polymeria ambigua*			C		1/1
plants	higher dicots	Convolvulaceae	*Merremia quinata*			C		2/2
plants	higher dicots	Convolvulaceae	*Ipomoea brownii*			C		1/1
plants	higher dicots	Convolvulaceae	*Ipomoea nil*		Y			4/3
plants	higher dicots	Convolvulaceae	*Jacquemontia*			C		2/1
plants	higher dicots	Crassulaceae	*Bryophyllum x houghtonii*		Y			1/1
plants	higher dicots	Cucurbitaceae	*Cucurbita*			C		2
plants	higher dicots	Cucurbitaceae	*Cucumis maderaspatanus*			C		5/4
plants	higher dicots	Cucurbitaceae	*Cucumis melo subsp. agrestis*			C		1/1
plants	higher dicots	Cucurbitaceae	*Neoachmandra cunninghamii*			C		1/1
plants	higher dicots	Cucurbitaceae	*Trichosanthes ovigera*			C		2/2
plants	higher dicots	Cucurbitaceae	*Cucurbitaceae*			C		2/2
plants	higher dicots	Cucurbitaceae	*Luffa aegyptiaca*			C		1/1
plants	higher dicots	Cucurbitaceae	*Sicyos australis*	star cucumber		C		1/1
plants	higher dicots	Cucurbitaceae	*Trichosanthes holtzei*			C		2/2
plants	higher dicots	Ebenaceae	*Diospyros humilis*	small-leaved ebony		C		1/1
plants	higher dicots	Elaeocarpaceae	*Elaeocarpus obovatus*	blueberry ash		C		1/1
plants	higher dicots	Elaeocarpaceae	*Elaeocarpus arnhemicus*			C		1/1
plants	higher dicots	Erythroxylaceae	*Erythroxylum ellipticum*			C		4/4
plants	higher dicots	Erythroxylaceae	*Erythroxylum australe*	cocaine tree		C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia*			C		3
plants	higher dicots	Euphorbiaceae	*Croton arnhemicus*			C		1/1
plants	higher dicots	Euphorbiaceae	*Mallotus philippensis*	red kamala		C		1/1
plants	higher dicots	Euphorbiaceae	*Chamaesyce bifida*			C		4/4
plants	higher dicots	Euphorbiaceae	*Chamaesyce hirta*	asthma plant	Y			3/3
plants	higher dicots	Euphorbiaceae	*Microstachys chamaelea*			C		2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*			C		1/1

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plants	higher dicots	Euphorbiaceae	*Claoxylon tenerifolium subsp. tenerifolium*			C		1/1
plants	higher dicots	Euphorbiaceae	*Chamaesyce mitchelliana*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria verrucosa*			C		3/3
plants	higher dicots	Fabaceae	*Indigofera scabrella*			C		1/1
plants	higher dicots	Fabaceae	*Indigofera linifolia*			C		3/2
plants	higher dicots	Fabaceae	*Indigofera pratensis*			C		10/7
plants	higher dicots	Fabaceae	*Jacksonia thesioides*			C		1/1
plants	higher dicots	Fabaceae	*Uraria lagopodioides*			C		1/1
plants	higher dicots	Fabaceae	*Crotalaria goreensis*	gambia pea	Y			1/1
plants	higher dicots	Fabaceae	*Aeschynomene villosa*		Y			1/1
plants	higher dicots	Fabaceae	*Tephrosia barbatala*			C		1/1
plants	higher dicots	Fabaceae	*Desmodium tortuosum*	Florida beggar-weed	Y			1/1
plants	higher dicots	Fabaceae	*Cajanus acutifolius*			C		4/4
plants	higher dicots	Fabaceae	*Zornia muelleriana*			C		1
plants	higher dicots	Fabaceae	*Indigofera linnaei*	Birdsville indigo		C		6/4
plants	higher dicots	Fabaceae	*Indigofera hirsuta*	hairy indigo		C		3/3
plants	higher dicots	Fabaceae	*Indigofera colutea*	sticky indigo		C		3/2
plants	higher dicots	Fabaceae	*Glycine tomentella*	woolly glycine		C		3/3
plants	higher dicots	Fabaceae	*Crotalaria montana*			C		2
plants	higher dicots	Fabaceae	*Zornia stirlingii*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia varians*			C		3/3
plants	higher dicots	Fabaceae	*Rhynchosia minima*			C		3
plants	higher dicots	Fabaceae	*Glycine syndetika*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria juncea*	sunhemp	Y			1/1
plants	higher dicots	Fabaceae	*Tephrosia filipes forma vestita*			C		2/2
plants	higher dicots	Fabaceae	*Neonotonia wightii var. wightii*		Y			1/1
plants	higher dicots	Fabaceae	*Vigna vexillata var. youngiana*			C		4/4
plants	higher dicots	Fabaceae	*Rhynchosia minima var. minima*			C		3/3
plants	higher dicots	Fabaceae	*Vigna radiata var. sublobata*			C		4/4
plants	higher dicots	Fabaceae	*Macroptilium atropurpureum*	siratro	Y			1/1
plants	higher dicots	Fabaceae	*Macroptilium lathyroides*		Y			1/1
plants	higher dicots	Fabaceae	*Desmodium rhytidophyllum*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia astragaloides*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia sp. (Copperfield River P.I.Forster PIF14768)*			C		3/3
plants	higher dicots	Fabaceae	*Galactia sp. (Myall Creek J.R.Clarkson 4885)*			C		4/4
plants	higher dicots	Fabaceae	*Vigna sp. (Station Creek R.J.Lawn CQ3284)*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria lanceolata subsp. lanceolata*		Y			2/2
plants	higher dicots	Fabaceae	*Galactia sp. (Laura J.C.Tothill JT53A)*			C		4/4
plants	higher dicots	Fabaceae	*Zornia muelleriana subsp. muelleriana*			C		1/1
plants	higher dicots	Fabaceae	*Phyllodium pulchellum var. pulchellum*			R		1/1
plants	higher dicots	Fabaceae	*Crotalaria montana var. angustifolia*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria medicaginea var. neglecta*			C		4/4
plants	higher dicots	Fabaceae	*Indigofera*			C		4/2
plants	higher dicots	Fabaceae	*Crotalaria*			C		2
plants	higher dicots	Fabaceae	*Tephrosia*			C		2/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Fabaceae	*Galactia*			C		2/1
plants	higher dicots	Fabaceae	*Glycine*			C		4/4
plants	higher dicots	Fabaceae	*Zornia*			C		5/4
plants	higher dicots	Fabaceae	*Vigna*			C		2/1
plants	higher dicots	Fabaceae	*Tephrosia astragaloides var. (Belyando Crossing E.J.Thompson+ 139)*			C		1/1
plants	higher dicots	Fabaceae	*Austrodolichos errabundus var. (Davies Creek J.R.Clarkson+ 7886B)*			C		1/1
plants	higher dicots	Fabaceae	*Canavalia papuana*	wild jack bean		C		2/2
plants	higher dicots	Fabaceae	*Abrus precatorius*	crabs-eye vine		C		1
plants	higher dicots	Fabaceae	*Vigna lanceolata*			C		1/1
plants	higher dicots	Fabaceae	*Hovea parvicalyx*			C		4/4
plants	higher dicots	Fabaceae	*Desmodium hannii*			C		1/1
plants	higher dicots	Fabaceae	*Bossiaea armitii*			C		1/1
plants	higher dicots	Fabaceae	*Hovea longipes*	brush hovea		C		3/3
plants	higher dicots	Fabaceae	*Uraria picta*			C		1/1
plants	higher dicots	Fabaceae	*Stylosanthes*			C		2
plants	higher dicots	Fabaceae	*Cajanus reticulatus var. reticulatus*			C		4/4
plants	higher dicots	Fabaceae	*Zornia muriculata subsp. angustata*			C		5/4
plants	higher dicots	Fabaceae	*Macrotyloma axillare var. axillare*		Y			1/1
plants	higher dicots	Fabaceae	*Galactia tenuiflora var. macrantha*			C		1/1
plants	higher dicots	Fabaceae	*Vigna vexillata var. angustifolia*			C		5/5
plants	higher dicots	Fabaceae	*Vigna lanceolata var. lanceolata*			C		11/10
plants	higher dicots	Fabaceae	*Vigna lanceolata var. filiformis*			C		3/3
plants	higher dicots	Fabaceae	*Tephrosia purpurea var. sericea*			C		1/1
plants	higher dicots	Fabaceae	*Indigastrum parviflorum*			C		4/4
plants	higher dicots	Fabaceae	*Crotalaria laburnifolia*		Y			1/1
plants	higher dicots	Fabaceae	*Crotalaria spectabilis*	showy rattlepod	Y			2/2
plants	higher dicots	Fabaceae	*Crotalaria medicaginea*	trefoil rattlepod		C		2
plants	higher dicots	Fabaceae	*Tephrosia flagellaris*			C		2/2
plants	higher dicots	Fabaceae	*Macrotyloma uniflorum*		Y			2/2
plants	higher dicots	Fabaceae	*Erythrina vespertilio*			C		3/1
plants	higher dicots	Fabaceae	*Desmodium brachypodum*	large ticktrefoil		C		5/5
plants	higher dicots	Fabaceae	*Pultenaea petiolaris*			C		1/1
plants	higher dicots	Flacourtiaceae	*Homalium brachybotrys*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia pilosa*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia armitiana*			C		3/3
plants	higher dicots	Haloragaceae	*Myriophyllum aquaticum*	Brazilian water milfoil	Y			1/1
plants	higher dicots	Haloragaceae	*Myriophyllum filiforme*			C		1/1
plants	higher dicots	Haloragaceae	*Myriophyllum verrucosum*	water milfoil		C		1/1
plants	higher dicots	Lamiaceae	*Ajuga australis*	Australian bugle		C		2/2
plants	higher dicots	Lamiaceae	*Teucrium argutum*			C		1/1
plants	higher dicots	Lamiaceae	*Premna acuminata*			C		2/2
plants	higher dicots	Lamiaceae	*Premna dallachyana*			C		3/3
plants	higher dicots	Lamiaceae	*Anisomeles malabarica*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Lamiaceae	*Glossocarya hemiderma*			C		1/1
plants	higher dicots	Lamiaceae	*Plectranthus congestus*			C		1/1
plants	higher dicots	Lamiaceae	*Clerodendrum floribundum*			C		2/2
plants	higher dicots	Lamiaceae	*Plectranthus parviflorus*			C		4/4
plants	higher dicots	Lamiaceae	*Clerodendrum tomentosum*			C		1/1
plants	higher dicots	Lamiaceae	*Callicarpa pedunculata*	velvet leaf		C		1/1
plants	higher dicots	Lamiaceae	*Glossocarya calcicola*			C		1/1
plants	higher dicots	Lamiaceae	*Callicarpa candicans*			C		2/2
plants	higher dicots	Lamiaceae	*Plectranthus mirus*			C		2/2
plants	higher dicots	Lecythidaceae	*Planchonia careya*	cockatoo apple		C		4/1
plants	higher dicots	Lentibulariaceae	*Utricularia dichotoma*	fairy aprons		C		2/2
plants	higher dicots	Loganiaceae	*Strychnos lucida*			C		2/2
plants	higher dicots	Loganiaceae	*Strychnos psilosperma*	strychnine tree		C		1/1
plants	higher dicots	Loranthaceae	*Amyema cambagei*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema biniflora*			C		2/2
plants	higher dicots	Loranthaceae	*Amyema bifurcata*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema miquelii*			C		1/1
plants	higher dicots	Loranthaceae	*Lysiana filifolia*			R		1/1
plants	higher dicots	Loranthaceae	*Dendrophthoe homoplastica*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema congener subsp. rotundifolia*			C		3/3
plants	higher dicots	Loranthaceae	*Amyema villiflora subsp. tomentilla*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema sanguinea var. sanguinea*			C		1/1
plants	higher dicots	Loranthaceae	*Dendrophthoe glabrescens*			C		2/2
plants	higher dicots	Lythraceae	*Lythrum paradoxum*			C		1/1
plants	higher dicots	Lythraceae	*Rotala tripartita*			C		2/2
plants	higher dicots	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		1/1
plants	higher dicots	Lythraceae	*Rotala occultiflora*			C		1/1
plants	higher dicots	Malpighiaceae	*Ryssopterys timorensis*			C		3/3
plants	higher dicots	Malvaceae	*Abutilon auritum*	Chinese lantern		C		1/1
plants	higher dicots	Malvaceae	*Hibiscus divaricatus*			C		1/1
plants	higher dicots	Malvaceae	*Abutilon micropetalum*			C		1/1
plants	higher dicots	Malvaceae	*Malvastrum americanum var. americanum*		Y			1/1
plants	higher dicots	Malvaceae	*Abutilon oxycarpum var. oxycarpum*			C		1/1
plants	higher dicots	Malvaceae	*Sida rohlenae subsp. rohlenae*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus meraukensis*	Merauke hibiscus		C		7/7
plants	higher dicots	Malvaceae	*Abelmoschus moschatus subsp. tuberosus*			C		1/1
plants	higher dicots	Malvaceae	*Sida magnifica*			C		2/2
plants	higher dicots	Malvaceae	*Sida spinosa*	spiny sida	Y			1/1
plants	higher dicots	Malvaceae	*Sida aprica*			C		1
plants	higher dicots	Malvaceae	*Sida acuta*	spinyhead sida	Y			1
plants	higher dicots	Malvaceae	*Hibiscus*			C		1/1
plants	higher dicots	Meliaceae	*Melia azedarach*	white cedar		C		2/2
plants	higher dicots	Meliaceae	*Turraea pubescens*	native honeysuckle		C		8/8
plants	higher dicots	Mimosaceae	*Acacia simsii*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia humifusa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia umbellata*			C		3/3

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plants	higher dicots	Mimosaceae	*Acacia galioides*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia bidwillii*			C		7/3
plants	higher dicots	Mimosaceae	*Acacia jackesiana*			R		4/4
plants	higher dicots	Mimosaceae	*Acacia longispicata*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia holosericea var. glabrata*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia disparrima subsp. calidestris*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia julifera subsp. gilbertensis*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia holosericea var. holosericea*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia multisiliqua*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leptostachya*	Townsville wattle		C		1/1
plants	higher dicots	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		3/3
plants	higher dicots	Moraceae	*Ficus*			C		1
plants	higher dicots	Moraceae	*Ficus virens var. virens*			C		1/1
plants	higher dicots	Moraceae	*Ficus virens var. sublanceolata*			C		1/1
plants	higher dicots	Moraceae	*Ficus rubiginosa forma rubiginosa*			C		5/5
plants	higher dicots	Moraceae	*Ficus superba var. henneana*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia*			C		3
plants	higher dicots	Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		C		8/5
plants	higher dicots	Myrtaceae	*Lophostemon grandiflorus subsp. grandiflorus*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus tereticornis subsp. tereticornis*			C		2/2
plants	higher dicots	Myrtaceae	*Lophostemon grandiflorus*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus camaldulensis*			C		1/1
plants	higher dicots	Myrtaceae	*Backhousia angustifolia*	narrow-leaved backhousia		C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus leptophleba*	Molloy red box		C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus chloroclada*	Baradine red gum		C		1
plants	higher dicots	Myrtaceae	*Corymbia erythrophloia*	variable-barked bloodwood		C		5/5
plants	higher dicots	Myrtaceae	*Corymbia confertiflora*			C		3/2
plants	higher dicots	Myrtaceae	*Melaleuca leucadendra*	broad-leaved tea-tree		C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus persistens*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus microneura*	Gilbert River box		C		2/1
plants	higher dicots	Myrtaceae	*Eucalyptus chartaboma*			C		2/2
plants	higher dicots	Myrtaceae	*Corymbia clarksoniana*			C		5/4
plants	higher dicots	Myrtaceae	*Eucalyptus granitica*	granite ironbark		C		1/1
plants	higher dicots	Myrtaceae	*Corymbia ellipsoidea*			C		2/2
plants	higher dicots	Myrtaceae	*Corymbia dallachiana*			C		5/3
plants	higher dicots	Myrtaceae	*Calytrix leptophylla*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca bracteata*			C		1/1
plants	higher dicots	Myrtaceae	*Corymbia terminalis*			C		1/1
plants	higher dicots	Myrtaceae	*Gossia bidwillii*			C		4/4
plants	higher dicots	Myrtaceae	*Eucalyptus*			C		2
plants	higher dicots	Nyctaginaceae	*Boerhavia paludosa*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia sp. (Bargara L.Pedley 5382)*			C		1/1
plants	higher dicots	Nyctaginaceae	*Boerhavia pubescens*			C		5/5
plants	higher dicots	Oleaceae	*Olea paniculata*			C		3/3
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. lineare*			C		1/1
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. racemosum*			C		1/1

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plants	higher dicots	Oleaceae	*Notelaea microcarpa var. microcarpa*			C		2/2
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		3/3
plants	higher dicots	Pentapetaceae	*Melhania brachycarpa*			C		2/2
plants	higher dicots	Pentapetaceae	*Melhania oblongifolia*			C		1/1
plants	higher dicots	Phyllanthaceae	*Breynia*			C		1
plants	higher dicots	Phyllanthaceae	*Breynia oblongifolia*			C		4/3
plants	higher dicots	Phyllanthaceae	*Phyllanthus collinus*			C		1/1
plants	higher dicots	Phyllanthaceae	*Bridelia leichhardtii*			C		2/2
plants	higher dicots	Phyllanthaceae	*Phyllanthus novae-hollandiae*			C		2/2
plants	higher dicots	Phyllanthaceae	*Flueggea virosa subsp. melanthesoides*			C		1
plants	higher dicots	Phyllanthaceae	*Phyllanthus reticulatus*			C		1/1
plants	higher dicots	Phyllanthaceae	*Antidesma parvifolium*			C		5/5
plants	higher dicots	Phyllanthaceae	*Phyllanthus*			C		3/3
plants	higher dicots	Phyllanthaceae	*Flueggea leucopyrus*			C		5/5
plants	higher dicots	Picrodendraceae	*Petalostigma pubescens*	quinine tree		C		4/3
plants	higher dicots	Pittosporaceae	*Bursaria incana*			C		5/3
plants	higher dicots	Pittosporaceae	*Auranticarpa edentata*			C		2/2
plants	higher dicots	Pittosporaceae	*Pittosporum spinescens*			C		2/2
plants	higher dicots	Plumbaginaceae	*Plumbago zeylanica*	native plumbago		C		3/3
plants	higher dicots	Polygalaceae	*Polygala*			C		2/2
plants	higher dicots	Polygalaceae	*Polygala rhinanthoides*			C		1/1
plants	higher dicots	Polygalaceae	*Polygala sp. (Portland Roads L.Pedley 2757)*			C		1/1
plants	higher dicots	Polygonaceae	*Polygonum plebeium*	small knotweed		C		1/1
plants	higher dicots	Portulacaceae	*Portulaca*			C		2/2
plants	higher dicots	Portulacaceae	*Portulaca oleracea*	pigweed	Y			1/1
plants	higher dicots	Portulacaceae	*Portulaca australis*			C		2/1
plants	higher dicots	Portulacaceae	*Calandrinia uniflora*			C		1/1
plants	higher dicots	Portulacaceae	*Grahamia australiana*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca filifolia*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca digyna*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca bicolor*			C		2/2
plants	higher dicots	Primulaceae	*Anagallis pumila*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea glauca*	bushy's clothes peg		C		1
plants	higher dicots	Proteaceae	*Persoonia falcata*			C		1/1
plants	higher dicots	Proteaceae	*Grevillea parallela*			C		4/2
plants	higher dicots	Proteaceae	*Grevillea mimosoides*			C		5/3
plants	higher dicots	Putranjivaceae	*Drypetes*			C		1
plants	higher dicots	Putranjivaceae	*Drypetes deplanchei*	grey boxwood		C		1/1
plants	higher dicots	Rhamnaceae	*Alphitonia*			C		1
plants	higher dicots	Rhamnaceae	*Alphitonia excelsa*	soap tree		C		3/3
plants	higher dicots	Rubiaceae	*Psychotria*			C		1/1
plants	higher dicots	Rubiaceae	*Psychotria daphnoides*			C		2/2
plants	higher dicots	Rubiaceae	*Psychotria loniceroides*	hairy psychotria		C		1
plants	higher dicots	Rubiaceae	*Oldenlandia mitrasacmoides subsp. mitrasacmoides*			C		1/1
plants	higher dicots	Rubiaceae	*Coelospermum paniculatum var. paniculatum*			C		1/1
plants	higher dicots	Rubiaceae	*Psychotria daphnoides var. angustifolia*			C		5/5

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plants	higher dicots	Rubiaceae	*Everistia vacciniifolia forma crassa*			C		2/2
plants	higher dicots	Rubiaceae	*Psydrax odorata subsp. australiana*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax saligna forma saligna*			C		1/1
plants	higher dicots	Rubiaceae	*Spermacoce brachystema*			C		1/1
plants	higher dicots	Rubiaceae	*Pavetta australiensis*			C		1/1
plants	higher dicots	Rubiaceae	*Pavetta brownii*			C		1/1
plants	higher dicots	Rubiaceae	*Pavetta granitica*			C		3/3
plants	higher dicots	Rubiaceae	*Larsenaikia ochreata*			C		3/3
plants	higher dicots	Rutaceae	*Micromelum minutum*	clusterberry		C		1/1
plants	higher dicots	Rutaceae	*Murraya ovatifoliolata*			C		2/2
plants	higher dicots	Rutaceae	*Geijera salicifolia*	brush wilga		C		3/3
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		2/1
plants	higher dicots	Sapindaceae	*Atalaya calcicola*			R		3/3
plants	higher dicots	Sapindaceae	*Cupaniopsis anacardioides*	tuckeroo		C		1
plants	higher dicots	Sapindaceae	*Dodonaea lanceolata var. subsessilifolia*			C		2/2
plants	higher dicots	Sapindaceae	*Dodonaea viscosa subsp. spatulata*			C		1/1
plants	higher dicots	Sapindaceae	*Distichostemon dodecandrus*			C		1/1
plants	higher dicots	Sapindaceae	*Cupaniopsis parvifolia*	small-leaved tuckeroo		C		1/1
plants	higher dicots	Sapindaceae	*Harpullia pendula*			C		1/1
plants	higher dicots	Sapindaceae	*Alectryon connatus*	grey birds-eye		C		2/2
plants	higher dicots	Sapindaceae	*Atalaya hemiglauca*			C		2
plants	higher dicots	Sapindaceae	*Alectryon tomentosus*			C		2/2
plants	higher dicots	Sapotaceae	*Sersalisia sericea*			C		3/2
plants	higher dicots	Sapotaceae	*Planchonella pohlmaniana var. (Gilbert River C.T.White 1409)*			C		1/1
plants	higher dicots	Scrophulariaceae	*Bacopa monnieri*			C		1/1
plants	higher dicots	Scrophulariaceae	*Limnophila brownii*			C		1/1
plants	higher dicots	Scrophulariaceae	*Lindernia anagallis*			C		1/1
plants	higher dicots	Scrophulariaceae	*Buchnera ramosissima*			C		1/1
plants	higher dicots	Scrophulariaceae	*Lindernia subulata*			C		1/1
plants	higher dicots	Scrophulariaceae	*Stemodia glabella*			C		1/1
plants	higher dicots	Scrophulariaceae	*Mimulus aquatilis*			C		3/3
plants	higher dicots	Simaroubaceae	*Ailanthus triphysa*	white siris		C		1/1
plants	higher dicots	Solanaceae	*Datura*			C		1/1
plants	higher dicots	Solanaceae	*Solanum lycopersicum var. cerasiforme*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum parvifolium subsp. tropicum*			C		2/2
plants	higher dicots	Solanaceae	*Solanum nigrum subsp. nigrum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum multiglochidiatum*			R		9/9
plants	higher dicots	Solanaceae	*Solanum angustum*			C		2/2
plants	higher dicots	Solanaceae	*Nicotiana tabacum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum erianthum*	potato tree	Y			1/1
plants	higher dicots	Solanaceae	*Solanum seaforthianum*	Brazilian nightshade	Y			1/1
plants	higher dicots	Solanaceae	*Solanum nodiflorum*		Y			1/1
plants	higher dicots	Solanaceae	*Solanum*			C		1
plants	higher dicots	Sparrmanniaceae	*Grewia*			C		1
plants	higher dicots	Sparrmanniaceae	*Grewia latifolia*	dysentery plant		C		1/1

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plants	higher dicots	Sparrmanniaceae	*Grewia mesomischa*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia retusifolia*			C		7/2
plants	higher dicots	Sparrmanniaceae	*Corchorus trilocularis*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Corchorus aestuans*			C		1
plants	higher dicots	Sparrmanniaceae	*Corchorus tridens*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Grewia papuana*			C		5/5
plants	higher dicots	Sterculiaceae	*Brachychiton*			C		1
plants	higher dicots	Sterculiaceae	*Brachychiton albidus*			R		8/8
plants	higher dicots	Sterculiaceae	*Brachychiton diversifolius subsp. orientalis*			C		1/1
plants	higher dicots	Sterculiaceae	*Brachychiton chillagoensis*			C		4/4
plants	higher dicots	Stylidiaceae	*Stylidium floodii*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium oviflorum*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium eriorhizum*			C		2/2
plants	higher dicots	Stylidiaceae	*Stylidium fissilobum*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium rotundifolium*			C		1/1
plants	higher dicots	Stylidiaceae	*Stylidium schizanthum*			C		1/1
plants	higher dicots	Thymelaeaceae	*Wikstroemia indica*	tie bush		C		3/1
plants	higher dicots	Thymelaeaceae	*Pimelea sericostachya subsp. amabilis*			C		1/1
plants	higher dicots	Ulmaceae	*Trema tomentosa*			C		2/2
plants	higher dicots	Ulmaceae	*Trema tomentosa var. aspera*			C		2/2
plants	higher dicots	Urticaceae	*Parietaria debilis*	native pellitory		C		1/1
plants	higher dicots	Urticaceae	*Pipturus argenteus*	white nettle		C		1/1
plants	higher dicots	Urticaceae	*Pouzolzia zeylanica*			C		1/1
plants	higher dicots	Urticaceae	*Dendrocnide photinophylla*	shiny-leaved stinging tree		C		2/2
plants	higher dicots	Urticaceae	*Laportea interrupta*			C		2/2
plants	higher dicots	Verbenaceae	*Lantana camara*		Y			3/3
plants	higher dicots	Violaceae	*Hybanthus enneaspermus*			C		6/4
plants	higher dicots	Violaceae	*Hybanthus stellarioides*			C		1/1
plants	higher dicots	Viscaceae	*Viscum articulatum*	flat mistletoe		C		3/3
plants	higher dicots	Viscaceae	*Viscum whitei subsp. whitei*			C		2/2
plants	higher dicots	Vitaceae	*Cissus oblonga*			C		2/2
plants	higher dicots	Vitaceae	*Tetrastigma nitens*	shining grape		C		1/1
plants	higher dicots	Vitaceae	*Tetrastigma petraeum*			C		1/1
plants	higher dicots	Vitaceae	*Clematicissus opaca*			C		4/3
plants	higher dicots	Vitaceae	*Cissus reniformis*			C		3/3
plants	higher dicots	Vitaceae	*Cayratia trifolia*			C		7/3
plants	higher dicots	Zygophyllaceae	*Tribulus terrestris*	caltrop		C		1/1
plants	higher dicots	Zygophyllaceae	*Tribulopis pentandra*			C		1/1
plants	lower dicots	Annonaceae	*Melodorum leichhardtii*			C		2/2
plants	lower dicots	Aristolochiaceae	*Aristolochia thozetii*			C		1/1
plants	lower dicots	Aristolochiaceae	*Aristolochia pubera var. aromatica*			C		1/1
plants	lower dicots	Hernandiaceae	*Gyrocarpus americanus subsp. sphenopterus*			C		1/1
plants	lower dicots	Menispermaceae	*Stephania japonica*			C		1
plants	lower dicots	Menispermaceae	*Stephania japonica var. discolor*			C		2/2
plants	lower dicots	Menispermaceae	*Stephania japonica var. timoriensis*			C		1/1
plants	lower dicots	Menispermaceae	*Stephania bancroftii*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	lower dicots	Piperaceae	*Peperomia blanda var. floribunda*			C		1/1
plants	lower dicots	Ranunculaceae	*Clematis glycinoides*			C		1/1
plants	monocots	Amaryllidaceae	*Crinum flaccidum*	Murray lily		C		2/2
plants	monocots	Amaryllidaceae	*Proiphys amboinensis*			C		2/2
plants	monocots	Araceae	*Typhonium*			C		1/1
plants	monocots	Asparagaceae	*Asparagus racemosus*	native asparagus		C		1/1
plants	monocots	Centrolepidaceae	*Centrolepis exserta*			C		1/1
plants	monocots	Commelinaceae	*Commelina diffusa*	wandering jew		C		1/1
plants	monocots	Commelinaceae	*Murdannia nudiflora*		Y			1/1
plants	monocots	Commelinaceae	*Commelina lanceolata*			C		1/1
plants	monocots	Commelinaceae	*Murdannia cryptantha*			C		3/3
plants	monocots	Commelinaceae	*Aneilema siliculosum*			C		1/1
plants	monocots	Commelinaceae	*Commelina ensifolia*	scurvy grass		C		6/6
plants	monocots	Commelinaceae	*Cyanotis axillaris*			C		2/2
plants	monocots	Commelinaceae	*Murdannia graminea*	murdannia		C		2/2
plants	monocots	Cyperaceae	*Scleria brownii*			C		1/1
plants	monocots	Cyperaceae	*Bulbostylis barbata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus victoriensis*			C		1/1
plants	monocots	Cyperaceae	*Scleria tricuspidata*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis sieberiana*			C		4/4
plants	monocots	Cyperaceae	*Eleocharis atropurpurea*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus validus*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis tetragona*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis dichotoma*	common fringe-rush		C		1/1
plants	monocots	Cyperaceae	*Cyperus sanguinolentus*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis geniculata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus macrostachyos*			C		1/1
plants	monocots	Cyperaceae	*Cyperus alopecuroides*			C		1/1
plants	monocots	Cyperaceae	*Cyperus*			C		1
plants	monocots	Cyperaceae	*Cyperus nutans var. eleusinoides*	flatsedge		C		2/2
plants	monocots	Cyperaceae	*Cyperus haspan subsp. juncoides*			C		1/1
plants	monocots	Cyperaceae	*Cyperus haspan subsp. haspan*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis cinnamometorum*			C		1/1
plants	monocots	Cyperaceae	*Schoenoplectus mucronatus*			C		2/2
plants	monocots	Cyperaceae	*Fimbristylis depauperata*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis simplex*			C		2/2
plants	monocots	Cyperaceae	*Cyperus perangustus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus scaber*			C		3/3
plants	monocots	Cyperaceae	*Scleria*			C		1
plants	monocots	Cyperaceae	*Fuirena incrassata*			C		1/1
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		1/1
plants	monocots	Cyperaceae	*Fimbristylis rara*			C		2/2
plants	monocots	Cyperaceae	*Cyperus squarrosus*	bearded flatsedge		C		1/1
plants	monocots	Dioscoreaceae	*Dioscorea transversa*	native yam		C		5/5
plants	monocots	Hemerocallidaceae	*Dianella*			C		3/3
plants	monocots	Hemerocallidaceae	*Dianella nervosa*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Laxmanniaceae	*Eustrephus latifolius*	wombat berry		C		4/3
plants	monocots	Orchidaceae	*Dipodium elegantulum*			C		3/3
plants	monocots	Orchidaceae	*Cymbidium canaliculatum*			C		2
plants	monocots	Poaceae	*Urochloa holosericea subsp. holosericea*			C		1/1
plants	monocots	Poaceae	*Bothriochloa decipiens var. cloncurrensis*			C		1/1
plants	monocots	Poaceae	*Aristida*			C		4
plants	monocots	Poaceae	*Enneapogon*			C		2
plants	monocots	Poaceae	*Arundinella*			C		1
plants	monocots	Poaceae	*Alloteropsis*			C		1
plants	monocots	Poaceae	*Themeda quadrivalvis*	grader grass	Y			2/1
plants	monocots	Poaceae	*Eragrostis schultzii*			C		1/1
plants	monocots	Poaceae	*Dichanthium fecundum*	curly bluegrass		C		1/1
plants	monocots	Poaceae	*Bothriochloa pertusa*		Y			3/3
plants	monocots	Poaceae	*Tragus australianus*	small burr grass		C		2/2
plants	monocots	Poaceae	*Aristida gracilipes*			C		1/1
plants	monocots	Poaceae	*Setaria sphacelata*		Y			1
plants	monocots	Poaceae	*Pennisetum ciliare*		Y			2/1
plants	monocots	Poaceae	*Lepturus minutus*			V		1/1
plants	monocots	Poaceae	*Echinochloa crus-galli*	barnyard grass	Y			1/1
plants	monocots	Poaceae	*Brachyachne convergens*	common native couch		C		1
plants	monocots	Poaceae	*Alloteropsis semialata*	cockatoo grass		C		2/2
plants	monocots	Poaceae	*Heteropogon triticeus*	giant speargrass		C		6/1
plants	monocots	Poaceae	*Heteropogon contortus*	black speargrass		C		5/1
plants	monocots	Poaceae	*Cymbopogon bombycinus*	silky oilgrass		C		2/2
plants	monocots	Poaceae	*Alloteropsis cimicina*			C		1/1
plants	monocots	Poaceae	*Urochloa praetervisa*			C		1
plants	monocots	Poaceae	*Tripogon loliiformis*	five minute grass		C		1/1
plants	monocots	Poaceae	*Panicum decompositum var. decompositum*			C		1/1
plants	monocots	Poaceae	*Leptochloa decipiens subsp. asthenes*			C		1/1
plants	monocots	Poaceae	*Dichanthium sericeum subsp. sericeum*			C		1/1
plants	monocots	Poaceae	*Megathyrsus maximus var. pubiglumis*		Y			1/1
plants	monocots	Poaceae	*Bothriochloa bladhii subsp. bladhii*			C		1/1
plants	monocots	Poaceae	*Echinochloa polystachya cv. Amity*		Y			1/1
plants	monocots	Poaceae	*Aristida holathera var. holathera*			C		1/1
plants	monocots	Poaceae	*Leptochloa fusca subsp. fusca*			C		1/1
plants	monocots	Poaceae	*Aristida*			C		1/1
plants	monocots	Poaceae	*Mnesithea rottboellioides*			C		1/1
plants	monocots	Poaceae	*Capillipedium parviflorum*	scented top		C		1/1
plants	monocots	Poaceae	*Enneapogon robustissimus*			C		2/2
plants	monocots	Poaceae	*Ancistrachne uncinulata*	hooky grass		C		2/2
plants	monocots	Poaceae	*Urochloa subquadripara*		Y			2/2
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			2/2
plants	monocots	Poaceae	*Eragrostis cilianensis*		Y			2/2
plants	monocots	Poaceae	*Enneapogon lindleyanus*			C		2/2
plants	monocots	Poaceae	*Digitaria minima*			C		1/1
plants	monocots	Poaceae	*Urochloa mutica*		Y			1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Eriachne obtusa*			C		1/1
plants	monocots	Poaceae	*Sarga plumosum*			C		4
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			6/1
plants	monocots	Poaceae	*Aristida acuta*			C		1/1
plants	monocots	Poaceae	*Schizachyrium*			C		1
plants	monocots	Poaceae	*Perotis rara*	comet grass		C		4/1
plants	monocots	Poaceae	*Panicum trichoides*			C		2/2
plants	monocots	Poaceae	*Eriachne mucronata*			C		1/1
plants	monocots	Poaceae	*Eragrostis sororia*			C		1/1
plants	monocots	Poaceae	*Echinochloa colona*	awnless barnyard grass	Y			1/1
plants	monocots	Poaceae	*Digitaria bicornis*			C		2/2
plants	monocots	Poaceae	*Andropogon gayanus*		Y			1/1
plants	monocots	Poaceae	*Eragrostis pilosa*	soft lovegrass	Y			1/1
plants	monocots	Poaceae	*Themeda triandra*	kangaroo grass		C		7/2
plants	monocots	Poaceae	*Themeda avenacea*			C		1/1
plants	monocots	Poaceae	*Dichanthium*			C		3
plants	monocots	Poaceae	*Sporobolus*			C		1
plants	monocots	Poaceae	*Urochloa*			C		1
plants	monocots	Poaceae	*Panicum*			C		2
plants	monocots	Pontederiaceae	*Monochoria cyanea*			C		1/1
plants	mosses	Moss	*Moss*			C		1/1
protists	green algae	Chlorophyceae	*Chara*			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix B

Regional Ecosystem Descriptions

Table Regional ecosystems in the vicinity of the study area

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
9.3.10	Not of concern	No concern at present	Occurs on swamps and occasionally along creek lines on basalt geologies.	Low closed forest to open woodland of *Melaleuca bracteata* (black teatree) ± *Casuarina cunninghamiana* (river sheoak) ± *Eucalyptus leptophleba* (Molloy red box) ± *Eucalypius spp.* ± Corymbia spp. emergents or vine scrub species. The shrub layer varies from absent, to a continuum with *M. bracteata* and dry rainforest species where these are present. The ground layer is dominated by tussock grasses such as *Heteropogon contortus* (black speargrass), *Eragrostis spp.* and *Eulalia aurea* (silky browntop) or *Cyperaceae spp.*(sedges). This community is very variable in structure and can also occur as small clumps of trees in association with the grassland regional ecosystem 9.3.27 or as a dense subcanopy layer of *M.bracteata* under a dominant canopy of *Casuarina cunninghamiana*. Occurs on swamps and occasionally along creek lines on basalt geologies. Major vegetation communities include: 9.3.10a: Palustrine wetland (e.g. vegetated swamp). *Melaleuca bracteata* dominated shrublands & woodlands on or fringing swamps & springs on basalts 9.3.10b: Riverine wetland or fringing riverine wetland. *Melaleuca bracteata* dominated shrublands & woodlands on creeklines on basalt
9.3.11	Not of concern	Of concern	Occurs in pockets surrounded by rocky basalt walls, run-on areas and areas of alluvial deposition on basalt geologies. 9.3.11a Occurs on run-on areas and areas of alluvial deposition on basalt geologies. 9.3.11b Closed depressions in the great basalt wall surrounded by Quaternary basalt.	Wetlands (sometimes ephemeral), fringed by grasses and sedges or with a fringing woodland which can contain *Eucalyptus camaldulensis* (river redgum) or *E. tereticornis* (bluegum) or *Melaleuca fluviatilis* (teatree). Major vegetation communities include: 9.3.11a: Palustrine wetland (e.g. vegetated swamp). Wetlands (sometimes ephemeral), often with a fringing woodland which can contain *Eucalyptus camaldulensis* (river redgum) or *E. tereticornis* (bluegum) ± *Eucalyptus platyphylla* (poplar gum) ± *E. leptophleba* (Molloy red box). The fringing vegetation can also contain a sub-canopy layer which can contain *Melaleuca spp.* (teatrees) Alternatively the fringing woodland species can occur as emergents ± *Casuarina spp.*(sheoaks).Ground layer species present include *Marselea hirsuta*, (short-fruited nardoo) *Schoenoplectus spp.* (clubrush) and *Eleocharis spp.* (spike-rushes) This unit may have areas of grassland included. 9.3.11b: Palustrine wetland (e.g. vegetated swamp). Permanent or ephemeral wetlands on dark basaltic clay with or without loose basalt rocks, surrounded by Quaternary basalt. This unit includes a mosaic of open areas and low rocky rises with *Eucalyptus camaldulensis*. Water bodies are fringed by *Sesbania cannabina*, grasses such as *Leptochloa fusca* and *Paspalidium udum*, and/or sedges such as *Cyperus exaltatus*, often

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
				with a zone of trees behind. Trees include *Eucalyptus camaldulensis* and/or *Melaleuca fluviatilis*. Open grassland areas include *Eriochloa sp.*, *Cyperus sp.* and various other spp.
9.3.20	Not of concern	No concern at present	Occur on alluvial plains.	Woodland to low open woodland of *Eucalyptus microneura* (Georgetown box) ± *Corymbia spp.* ± *E. leptophleba* (Molloy red box) ± *Terminalia spp*. There is an absent to sparse mixed shrub layer which can include juvenile canopy species, *Gardenia vilhelmii* (breadfruit), *Dolichondrone heterophylla* (lemonwood), *Atalaya hemiglauca* (whitewood), *Melaleuca spp.* and *Carissa lanceolata* (currantbush) , with these species sometimes forming an open sub canopy layer. The grassy ground layer is generally dominated by *Heteropogon contortus* (black speargrass), *Eragrostis spp.* and *Aristida spp.*
9.5.2	Of concern	Of concern. Threatening processes include grazing, disturbance by feral pigs and weed invasion by *Lantana camara*. Fire is a threat in disturbed areas.	Occurs on red kandosols, often overlying a lateritic surface, on Tertiary plateaus.	Semi-evergreen vine thicket generally dominated by *Lysiphyllum carronii* (Queensland ebony), *Terminalia oblongata* (yellowwood) and *Homalium brachybotrys*. Other dominants may include *Brachychiton australis*, *Bridelia leichhardtii*, *Drypetes deplanchei* and *Pleiogynium timorense* (Burdekin plum).
9.8.1	Not of concern	No concern at present	Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil.	Open woodland to woodland of *Eucalyptus crebra* (narrow-leaved ironbark) ± Corymbia *dallachiana* (Dallachys gum) ± *C.erythrophloia* (red bloodwood). *E.leptophleba* (Molloy red box) sometimes occurs as a dominant. The midlayer is generally absent but an open subcanopy or shrub layer sometimes occurs. Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil. Major vegetation communities include: 9.8.1a: Open woodland to woodland of *Eucalyptus crebra* (narrow-leaved ironbark) ± *Corymbia dallachiana* (Dallachys gum) ± *C.erythrophloia* (red bloodwood) ± *Corymbia spp.* ± *Eucalyptus spp.* In some areas *E.granitica* (granite ironbark) may replace *E.crebra*. A sub-canopy can occur and include canopy species, *Bursaria incana* (prickly pine) and *Petalostigma pubescens* (quinine). The shrub layer ranges from absent to patches of shrubs including *Maytenus cunninghamii* (yellowberry bush), *B. incana* (prickly pine), *Carissa*

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
				lanceolata (currantbush), and *Grevillea parallela* (silver oak). The ground layer is dense and generally dominated by *Heteropogon contortus* (black speargrass), Themeda triandra (kangaroo grass) and *H.triticeus* (giant speargrass). Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil. 9.8.1b: Open woodland to woodland of *Eucalyptus leptophleba* (Molloy red box) ± *C. erythrophloia* (red bloodwood) ± *Corymbia dallachiana* (Dallachys gum) ± *C. confertiflora* (broad-leaved carbeen) ± *C. clarksoniana* (Clarkson's bloodwood) ± *E.platyphylla* (poplar gum). There is generally no shrub layer but scattered species including *Planchonia careya* (cocky apple), *Maytenus cunninghamii* (yellowberry bush) and *Carissa lanceolata* (currantbush) can occur. The ground layer is dense and grassy and can include *Heteropogon contortus* (black speargrass) and/or *Themeda spp*. Occurs on basalt plains and rocky basalt plains and hills with varying depths of soil.
9.8.9	Not of concern	No concern at present	Occurs on basalt plains to gently undulating plains. Some areas may have basalt boulders to the surface. Soils are generally brown-black vertosols and brown ferrosols.	Open woodland to woodland of *Eucalyptus orgadophila* (mountain coolibah) ± *Corymbia dallachiana* (Dallachy's gum) ± *E.crebra* (sens.lat.) (narrow-leaved ironbark) ± *C.erythrophloia* (red bloodwood) with occasional small patches of grassland. There is generally no mid layer although scattered juveniles of the canopy species may occur or in the wetter areas clumps of *Melaleuca bracteata* (black teatree) can occur. The ground layer is dense and grassy and dominated by *Heteropogon contortus* (black speargrass) and/or *Themeda triandra* (kangaroo grass).
9.8.13	Not of concern	No concern at present. Degradation from grazing pressure	Occurs on basalt plains and undulating plains with varying soil depths.	Grassland to very open grassland of *Iseilema spp*. (Flinders grass) and/or *Dichanthium spp*. ± *Bothriochloa spp*. (bluegrasses) ± *Heteropogon contortus* (black speargrass) ± *Ophiuros exaltatus* (canegrass) ± *Eulalia aurea* (silky browntop) ± *Aristida spp*. In some areas any of the sub-dominant species can be dominant. There are often emergents including *Corymbia dallachiana* (Dallachy's gum), *Eucalyptus crebra* (narrow-leaved ironbark), *E.orgadophila* (mountain coolibah) and *C.erythrophloia* (red bloodwood) or scattered shrubs including *Carissa lanceolata* (currantbush) and *Atalaya hemiglauca* (whitewood).
9.12.1	Not of concern	No concern at present. Vegetation communities within this regional ecosystem have rare and threatened	Occurs on a variety of landforms from undulating plains to steep hills on granodiorites 9.12.1d: Occurs on steep rugged hills and mountain ranges 9.12.1f: Occurs on granite	Low open woodland to woodland of *Eucalyptus crebra* (narrow-leaved ironbark) and/or *E.xanthoclada* (yellow-branched ironbark) and/or *E.drepanophylla* (grey ironbark) and/or *E. paedoglauca* (Mount Stewart ironbark). The mid layer is usually absent but an open sub-canopy or shrub layer can occur. Sparsely wooded areas may grade into grassland. Major vegetation communities include: 9.12.1a: Low open woodland to woodland of *Eucalyptus crebra* (narrow-leaved ironbark) ± *Corymbia dallachiana* (Dallachy's gum) ± *C.erythrophloia* (red bloodwood) ± *C.clarksoniana* (Clarkson's bloodwood) ± *Corymbia spp*. *E.exilipes* (fine-leaved ironbark) can sometimes occur as a dominant. An open sub-canopy can occur with mixed species including Geijera salicifolia (wilga), *Petalostigma pubescens* (quinine),

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
		species present and are degraded by grazing pressure, and environmental weeds.	hills.	*Maytenus cunninghamii* (yellowberry bush), *Bursaria incana* (prickly pine), *Acacia spp.* as well as juvenile canopy species. An open shrub layer can occur and include canopy and sub-canopy species or *Carrisa lanceolata* (currantbush). The sparse to dense ground layer is dominated by *Heteropogon contortus* (black speargrass) and *Themeda triandra* (kangaroo grass). Small areas in the south of the bioregion that can be dominated by Corymbia terminalis (western bloodwood). *C.erythrophloia* or *C.leichhardtii* (yellowjacket) may be included in this vegetation community. 9.12.1b: Open woodland to low open woodland of *Eucalyptus xanthoclada* (yellow-branched ironbark) ± *Corymbia erythrophloia* (red bloodwood) ± *Corymbia spp.* ± *Eucalyptus spp.* There may be a sparse sub-canopy layer which can include Acacia bidwillii (corkwood wattle), *Bursaria incana* (prickly pine) or *Euroschinus spp*. The shrub layer is generally dense and can contain mixed species including *Maytenus* cunninghamii (yellowberry bush), B.incana, Carissa lanceolata (currantbush), A.bidwilli and Persoonia falcata. The ground layer is sparse tussock grasses dominated by *Heteropogon contortus* (black speargrass). 9.12.1c: Woodland of *Eucalyptus drepanophylla* (grey ironbark) or *E.crebra* (narrow-leaved ironbark) ± *Corymbia erythrophloia* (red bloodwood) ± *C.dallachiana* (Dallachy's gum). An open subcanopy or shrub layer containing canopy species ± *Acacia bidwillii* (corkwood wattle) ± *Bursaria incana* (prickly pine) often occurs. The grassy ground is dominated by *Themeda triandra* (kangaroo grass) and *Heteropogon contortus* (black speargrass). 9.12.1d: Woodland of *Eucalyptus crebra* (narrow-leaved ironbark) or *E.granitica* (granite ironbark) ± *C.dallachiana* (Dallachy's gum) ± *Corymbia spp.* The mid layer ranges from absent to sparse and can include *Acacia flavescens* (yellow wattle), *Grevillea glauca* (bushmans clothepeg), *Bursaria incana* (prickly pine) and juvenile canopy species. The dense grassy ground layer is dominated by *Heteropogon contortus* (black speargrass) and *Themeda triandra* (kangaroo grass). 9.12.1e: Grassland with isolated trees of *Eucalyptus crebra* (sens. lat.)(narrow-leaved ironbark) ± clumps of shrubs of *Acacia decora* and/or *A.leptostachya* (slender wattle) and/or *Jacksonia thesioides* and/or *Allocasuarina inophloia* (stringybark sheoak). Grassland. 9.12.1f: Woodland of *Eucalyptus paedoglauca* (Mount Stewart ironbark) ± *Corymbia erythrophloia* (red bloodwood) ± *C.dallachiana* (Dallachy's gum). Midlayer absent to sparse. Grassy cover dominated by *Heteropogon contortus* (black speargrass) and *Themeda triandra* (kangaroo grass).
9.12.3	Not of concern	No concern at present	Occurs in patches on footslopes, low hills, crests	*Eucalyptus chartaboma* (Queensland flaky-bark) and *E. crebra* (sens. lat.)(narrow-leaved ironbark) or *E. cullenii* (Cullen's ironbark) ± *Corymbia erythrophloia* (red bloodwood) ± *E.tetrodonta* (Darwin stringybark) ±

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
			and ridges.	*C.dallachiana* (Dallachy's gum) ± *C.clarksoniana* (Clarkson's bloodwood) woodland. The mid layer varies from absent to an open shrub layer including juveniles of canopy species, *Petalostigma banksii* (smooth-leaved quinine), *Terminalia aridicola* (arid peach), *Erythrophleum chlorostachys* (Cooktown ironwood), *Acacia spp.*, *Jacksonia spp.*, *Grevillea spp.*, *Bossiaea armitii* and *Xylomelum scottianum*. The sparse ground layer is grassy. In the north of the bioregion the *Eucalyptus crebra* is replaced by *E. cullenii.* Small areas with *C.trachyphloia* (brown bloodwood) or *E.similis* (yellowjacket) may occur. Major vegetation communities include: 9.12.3a: *Eucalyptus chartaboma* (Queensland flaky-bark) and *E.crebra* (sens. lat.)(narrow-leaved ironbark) or *E.cullenii* (Cullen's ironbark) ± *Corymbia erythrophloia* (red bloodwood) ± *E. tetrodonta* (Darwin stringybark) ± *C.dallachiana* (Dallachy's gum) ± *C.clarksoniana* (Clarkson's bloodwood) woodland. The mid layer varies from absent to an open shrub layer including juveniles of canopy species, *Petalostigma banksii* (smooth-leaved quinine) , *Terminalia aridicola* (arid peach) , *Erythrophleum chlorostachys* (Cooktown ironwood) , *Acacia spp.*, *Jacksonia spp*. and *Grevillea spp*.. The sparse ground layer is grassy. 9.12.3b: *Eucalyptus chartaboma* (Queensland flaky-bark), *Corymbia pocillum*, *C.trachyphloia* (brown bloodwood) and *E. crebra* (sens. lat.)(narrow-leaved ironbark) ± *E.similis* (yellowjacket) woodland. The mid-dense mid layer is shrubs including *Acacia julifera* (catkin wattle), *Gastrolobium grandiflorum, Bossiaea armitii, Xylomelum scottianum* and *Grevillea spp*.. The sparse ground layer is grassy.
9.12.8	Not of concern	No concern at present	Occurs on hills and steep slopes with skeletal soils and frequent surface boulders. 9.12.8b: Occurs on granite boulders and rock pavements.	Semi-evergreen vine thicket of species including *Cochlospermum gillivraei*, *Canarium australianum*, *Ficus spp.*, *Brachychiton spp.*, *Strychnos lucida*, *Cupaniopsis anacardioides*, *Acacia spp.*, *Schefflera actinophylla*, *Gyrocarpus americanus*, *Pouteria spp.*, *Carissa lanceolata*, *Erythroxylum australe* and *Larsenaikia ochreata*. Areas of *Eucalyptus crebra* (sens. lat.) emergents may occur. Major vegetation communities include: 9.12.8a: Semi-evergreen vine thicket of species including *Cochlospermum gillivraei* (kapok), *Canarium australianum*, *Ficus spp., Brachychiton spp., Strychnos lucida* (strychnine bush), *Cupaniopsis anacardioides, Acacia spp., Schefflera actinophylla* (umbrella tree), *Gyrocarpus americanus* (helicopter tree), *Pouteria spp., Carissa lanceolata* (currantbush), *Erythroxylum australe* (cocaine tree) and *Larsenaikia ochreata*. Areas of *Eucalyptus crebra* (sens. lat.)(narrow-leaved ironbark) emergents may occur. 9.12.8b: Scattered semi-evergreen vine thicket species on granite boulders and rock pavements.

RE	VM Act Status [1]	Biodiversity Status [2]	Landform	Description
9.12.36	Not of concern	No concern at present	Occurs on rocky outcrops and tops of hills with granite boulders to the surface.	Low woodland to low open woodland of *Cochlospermum gregorii* or *C. gillivraei* (kapok) ± *Terminalia spp.* ± *Erythrophleum chlorostachys* (Cooktown ironwood) ± *Corymbia erythrophloia* (red bloodwood) ± *Brachychiton chillagoensis* (kurrajong) or low woodland to woodland of *Acacia leptostachya* (slender wattle) and/or *Petalostigma banksii* (smooth-leaved quinine) ± *Eucalyptus microneura* (Georgetown box) ± *Cochlospermum spp.* The subdominants vary in composition and can include deciduous vine thickets species. A sparse shrub layer can include *P.banksii*, *Acacia spp.* and *Grevillea spp.* The ground layer is often dominated by *Arsitida spp.*, *Schizachyrium spp.(*firerass) and *Heteropogon contortus* (black speargrass). Major vegetation communities include: 9.12.36a: Low woodland to low open woodland of *Cochlospermum gregorii* or *C. gillivraei* (kapok) ± *Terminalia spp* ± *Erythrophleum chlorostachys* (Cooktown ironwood) ± *Corymbia erythrophloia* (red bloodwood) ± *Brachychiton spp.* The subdominants can include vine thicket species such as *Ficus opposita* (sandpaper fig), *Drypetes deplanchei*(yellow tulipwood), *Pouteria sericea*(wongay) and *Homalium brachybotrys*. A sparse to open mixed shrub layer can include *Persoonia falcata*, *Petalostigma banksii* (smooth-leaved quinine), Grevillea mimosoides and *Acacia spp.* The ground layer is often dominated by *Aristida spp.*, *Schizachyrium spp.* (firegrass) and *Heteropogon contortus* (black speargrass). Occurs on rocky outcrops and tops of hills with granite boulders to the surface. 9.12.36b: Low open woodland to low woodland of Acacia leptostachya (slender wattle) ± *Eucalyptus microneura* (Georgetown box) ± *Cochlospermum gregorii* or *C.gillivraei* (kapok) ± *Corymbia erythrophloia* (red bloodwood) or *C.pocillum* ± *Erythrophleum chlorostachys* (Cooktown ironwood). *Eucalypus microneura* often occurs as an emergent. The shrub layer is of scattered plants and can include *Grevillea spp.*, *Acacia spp.*and *Petalostigma banksii* (smooth-leaved quinine). The sparse to dense grassy ground layer is dominated by Aristida spp. and *Shizachyrium* fragile (firegrass). Occurs on steep rocky granite hills. 9.12.36c: Shrubland of *Acacia leptostachya* (slender wattle) and/or *Petalostigma banksii* (smooth-leaved quinine) ± *Corymbia erythrophloia* (red bloodwood). *Erythrophleum chlorostachys* (Cooktown ironwood) and/or *Corymbia erythrophloia* may occur as emergents. Scattered *P.banksii* can occur in the shrub layer. The sparse ground layer is grassy and dominated by *Aristida spp.* and *Heteropogon contortus* (black speargrass). Occurs on granite hills.

Note: 1 – VM Act (*Vegetation Management Act 1999)*
2 – Sourced from the EPA Regional Ecosystem Description Database (REDD) version 5.2.

Appendix C

Soil Testing Results

Soil profile as evidenced in a recent excavator's pit.

LABORATORY REPORT COVERSHEET

Date: 26 October 2009

To: GHD Pty Ltd
PO Box 819
CAIRNS QLD 4870

Attention: personal information

Your Reference: 4215991 - Mt Surprise REF
Laboratory Report No: CE65183

Samples Received: 6/10/2009
Samples / Quantity: 3 Soils

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.
This report supersedes any preliminary results issued

NR
personal information
Manager
CAIRNS

NR
personal information
Administration Manager
CAIRNS

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 2, 58 Comport Street, Portsmith 4870 QLD Australia
t +61 (0)7 4035 5111 f +61 (0)7 4035 5122

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

Agricultural Soil Analyses Our Reference Your Reference Type of Sample Date Sampled	Units	CE65183-1 Site 1 Soil 2/10/2009	CE65183-2 Site 2 Soil 1/10/2009	CE65183-3 Site 3 Soil 2/10/2009
Date Extracted		7/10/2009	7/10/2009	7/10/2009
Date Analysed		7/10/2009	7/10/2009	7/10/2009
pH (1:5)	pH Units	6.0	6.5	6.1
Electrical Conductivity (1:5)	µS/cm	13	15	10
TDS	mg/kg	44	50	34
pH - $CaCl_2$	pH units	4.9	5.7	5.0
Chloride, Cl (1:5)	mg/kg	<10	<10	<10
Sulphur, S	mg/kg	<1	<1	1
Total Oxidised Nitrogen (as N)	mg/kg	0.1	<0.1	0.2
Total Kjeldahl Nitrogen (as N)	mg/kg	340	95	180
Total Nitrogen (as N) (TKN + TON)	mg/kg	340	95	180
Total Phosphorus	mg/kg	57	240	120
Colwell Phosphorus	mg/kg	1	6	4
Total Organic Carbon	% w/w	0.40	0.21	0.35
Organic Matter	% w/w	0.69	0.36	0.60
Carbon-Nitrogen Ratio		12	22	19
Sodium, Na	mg/kg	8	4	5
Sodium (meq%)	meq%	0.04	0.02	0.02
Exchangeable Sodium	%	2	2	<1
Potassium, K	mg/kg	130	140	170
Potassium (meq%)	meq%	0.33	0.36	0.43
Exchangeable Potassium	%	20	30	17
Calcium, Ca	mg/kg	120	97	160
Calcium (meq%)	meq%	0.60	0.48	0.80
Exchangeable Calcium	%	35	41	31
Magnesium, Mg	mg/kg	89	40	160
Magnesium (meq%)	meq%	0.73	0.33	1.3
Exchangeable Magnesium	%	43	28	51

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

Agricultural Soil Analyses Our Reference Your Reference Type of Sample Date Sampled	Units	CE65183-1 Site 1 Soil 2/10/2009	CE65183-2 Site 2 Soil 1/10/2009	CE65183-3 Site 3 Soil 2/10/2009
CEC	meq%	1.7	1.2	2.6
CEC (Sol Salts Removed)	meq%	2.0	1.0	3.0
Iron, Fe (DTPA)	mg/kg	68	100	61
Manganese, Mn (DTPA)	mg/kg	15	52	3.0
Copper, Cu (DTPA)	mg/kg	<0.5	9.0	<0.5
Zinc, Zn (DTPA)	mg/kg	<0.5	<0.5	<0.5

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

-------- Our Reference Your Reference Type of Sample Date Sampled	Units	CE65183-1 Site 1 Soil 2/10/2009	CE65183-2 Site 2 Soil 1/10/2009	CE65183-3 Site 3 Soil 2/10/2009
Saturated Hydraulic Conductivity ^	mm/hr	200	27	310
Bulk Density ^	mg/m^3	1.4	1.6	1.4
D% ^		32	33	10
EAT ^		5	3(1)	5

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Date Extracted			
Date Analysed			
pH (1:5)	pH Units	0.1	AN101
Electrical Conductivity (1:5)	µS/cm	5	AN106
TDS	mg/kg	20	Calculation
pH - $CaCl_2$	pH units	0.1	R & H ##
Chloride, Cl (1:5)	mg/kg	10	AN274 CEA-020
Sulphur, S	mg/kg	1	R & H ##
Total Oxidised Nitrogen (as N)	mg/kg	0.1	AN248 CEA-001
Total Kjeldahl Nitrogen (as N)	mg/kg	5	AN281 CEA-016
Total Nitrogen (as N) (TKN + TON)	mg/kg	5	Calculation
Total Phosphorus	mg/kg	5	AN279 CEA-015
Colwell Phosphorus	mg/kg	1	AN015
Total Organic Carbon	% w/w	0.05	AN273 CEA-023
Organic Matter	% w/w	0.01	Calculation
Carbon-Nitrogen Ratio		0.01	Calculation
Sodium, Na	mg/kg	2	AN122 CEI-014
Sodium (meq%)	meq%	0.01	Calculation
Exchangeable Sodium	%	1	Calculation
Potassium, K	mg/kg	2	AN122 CEI-014
Potassium (meq%)	meq%	0.01	Calculation
Exchangeable Potassium	%	1	Calculation
Calcium, Ca	mg/kg	2	AN122 CEI-014
Calcium (meq%)	meq%	0.01	Calculation
Exchangeable Calcium	%	1	Calculation
Magnesium, Mg	mg/kg	2	AN122 CEI-014
Magnesium (meq%)	meq%	0.01	Calculation
Exchangeable Magnesium	%	1	Calculation
CEC	meq%	0.01	R & H ##

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
CEC (Sol Salts Removed)	meq%	0.01	R & H ##
Iron, Fe (DTPA)	mg/kg	0.5	R & H ##
Manganese, Mn (DTPA)	mg/kg	0.5	R & H ##
Copper, Cu (DTPA)	mg/kg	0.5	R & H ##
Zinc, Zn (DTPA)	mg/kg	0.5	R & H ##

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Saturated Hydraulic Conductivity ^	mm/hr		External
Bulk Density ^	mg/m^3		External
D% ^			External
EAT ^			External

CLIENT: GHD Pty Ltd

PROJECT: 4215991 - Mt Surprise REF

Laboratory Report No: CE65183

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Duplicate Sm#	Duplicate Sample||Duplicate	Spike Sm#	Spike Recovery
Date Extracted		07/10/09	CE65183-1	7/10/2009 || 7/10/2009	Batch Spike	-
Date Analysed		07/10/09	CE65183-1	7/10/2009 || 7/10/2009	Batch Spike	-
pH (1:5)	pH Units	-	CE65183-1	6.0 || [N/T]	Batch Spike	-
Electrical Conductivity (1:5)	µS/cm	-	CE65183-1	13 || [N/T]	Batch Spike	-
TDS	mg/kg	-	CE65183-1	44 || [N/T]	Batch Spike	-
pH - $CaCl_2$	pH units	-	CE65183-1	4.9 || [N/T]	Batch Spike	-
Chloride, Cl (1:5)	mg/kg	<10	CE65183-1	<10 || <10	Batch Spike	103%
Sulphur, S	mg/kg	<1	CE65183-1	<1 || <1	Batch Spike	105%
Total Oxidised Nitrogen (as N)	mg/kg	<0.1	CE65183-1	0.1 || [N/T]	Batch Spike	100%
Total Kjeldahl Nitrogen (as N)	mg/kg	<5	CE65183-1	340 || 320 || RPD: 6	Batch Spike	100%
Total Nitrogen (as N) (TKN + TON)	mg/kg	-	CE65183-1	340 || 320 || RPD: 6	Batch Spike	-
Total Phosphorus	mg/kg	<5	CE65183-1	57 || [N/T]	Batch Spike	93%
Colwell Phosphorus	mg/kg	<1	CE65183-1	1 || 2 || RPD: 67	Batch Spike	101%
Total Organic Carbon	% w/w	<0.05	CE65183-1	0.40 || 0.43 || RPD: 7	Batch Spike	93%
Organic Matter	% w/w	-	CE65183-1	0.69 || 0.74 || RPD: 7	Batch Spike	-
Carbon-Nitrogen Ratio		-	CE65183-1	12 || 13 || RPD: 8	Batch Spike	-
Sodium, Na	mg/kg	<2	CE65183-1	8 || 8 || RPD: 0	Batch Spike	82%
Sodium (meq%)	meq%	-	CE65183-1	0.04 || 0.03 || RPD: 29	Batch Spike	-
Exchangeable Sodium	%	-	CE65183-1	2 || 2 || RPD: 0	Batch Spike	-
Potassium, K	mg/kg	<2	CE65183-1	130 || 130 || RPD: 0	Batch Spike	115%
Potassium (meq%)	meq%	-	CE65183-1	0.33 || 0.33 || RPD: 0	Batch Spike	-
Exchangeable Potassium	%	-	CE65183-1	20 || 20 || RPD: 0	Batch Spike	-
Calcium, Ca	mg/kg	<2	CE65183-1	120 || 120 || RPD: 0	Batch Spike	106%
Calcium (meq%)	meq%	-	CE65183-1	0.60 || 0.60 || RPD: 0	Batch Spike	-
Exchangeable Calcium	%	-	CE65183-1	35 || 36 || RPD: 3	Batch Spike	-
Magnesium, Mg	mg/kg	<2	CE65183-1	89 || 88 || RPD: 1	Batch Spike	88%

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Duplicate Sm#	Duplicate Sample||Duplicate	Spike Sm#	Spike Recovery
Magnesium (meq%)	meq%	-	CE65183-1	0.73 || 0.72 || RPD: 1	Batch Spike	-
Exchangeable Magnesium	%	-	CE65183-1	43 || 43 || RPD: 0	Batch Spike	-
CEC	meq%	-	CE65183-1	1.7 || 1.7 || RPD: 0	Batch Spike	-
CEC (Sol Salts Removed)	meq%	-	CE65183-1	2.0 || [N/T]	Batch Spike	-
Iron, Fe (DTPA)	mg/kg	<0.5	CE65183-1	68 || 65 || RPD: 5	Batch Spike	114%
Manganese, Mn (DTPA)	mg/kg	<0.5	CE65183-1	15 || 15 || RPD: 0	Batch Spike	81%
Copper, Cu (DTPA)	mg/kg	<0.5	CE65183-1	<0.5 || <0.5	Batch Spike	108%
Zinc, Zn (DTPA)	mg/kg	<0.5	CE65183-1	<0.5 || <0.5	Batch Spike	84%
QUALITY CONTROL	**UNITS**	**Blank**	**Duplicate Sm#**	**Duplicate Sample||Duplicate**	**Spike Sm#**	**Spike Recovery**
Saturated Hydraulic Conductivity ^	mm/hr	-	CE65183-1	200 || [N/T]	Batch Spike	-
Bulk Density ^	mg/m^3	-	CE65183-1	1.4 || [N/T]	Batch Spike	-
D% ^		-	CE65183-1	32 || [N/T]	Batch Spike	-
EAT ^		-	CE65183-1	5 || [N/T]	Batch Spike	-

CLIENT: GHD Pty Ltd
PROJECT: 4215991 - Mt Surprise REF **Laboratory Report No:** CE65183

LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.
Method from Rayment & Higginson - "Australian Laboratory Handbook of Soil and Water Chemical Methods".
^ This analysis determined at Scone Research Centre, (Scone, NSW), their reference SCO09/285R1. Please note that NATA accreditation does not cover the performance of this analysis.

Analysis Date: **Between** 6/10/09 **and** 26/10/09

SGS Terms and Conditions are available at www.au.sgs.com

LABORATORY REPORT COVERSHEET

Date: 11 November 2009

To: GHD Pty Ltd
PO Box 819
CAIRNS QLD 4870

Attention: personal information

Your Reference: 4215991 Mt Surprise REF
Laboratory Report No: CE65183A

Samples Received: 6/10/2009
Samples / Quantity: 3 Soils

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

This Report must not be reproduced, except in full.

NR
personal information
Manager
CAIRNS

NR
personal information
Administration Manager
CAIRNS

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 2, 58 Comport Street, Portsmith 4870 QLD Australia
t +61 (0)7 4035 5111 f +61 (0)7 4035 5122

CLIENT: GHD Pty Ltd **Laboratory Report No:** CE65183A
PROJECT: 4215991 Mt Surprise REF

LABORATORY REPORT

Sieve Analysis Our Reference Your Reference Type of Sample Date Sampled Depth	Units	CE65183A-1 Site 1 Soil 2/10/2009	CE65183A-2 Site 2 Soil 1/10/2009	CE65183A-3 Site 3 Soil 2/10/2009
Date Extracted		6/11/2009	6/11/2009	6/11/2009
Date Analysed		9/11/2009	9/11/2009	9/11/2009
2.36mm (Fine Gravel)	% passing	48	12	47
600µm (Medium Sand)	% passing	28	8	16
300µm (Medium Sand)	% passing	21	6	13
212µm (Fine Sand)	% passing	18	5	10
75µm (Silt & Clay)	% passing	10	3	7

CLIENT: GHD Pty Ltd **Laboratory Report No:** CE65183A
PROJECT: 4215991 Mt Surprise REF

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Sieve Analysis			
Date Extracted			
Date Analysed			
2.36mm (Fine Gravel)	% passing	1	AS 1289.3.6.3-1994
600µm (Medium Sand)	% passing	1	AS 1289.3.6.3-1994
300µm (Medium Sand)	% passing	1	AS 1289.3.6.3-1994
212µm (Fine Sand)	% passing	1	AS 1289.3.6.3-1994
75µm (Silt & Clay)	% passing	1	AS 1289.3.6.3-1994

CLIENT: GHD Pty Ltd **Laboratory Report No:** CE65183A
PROJECT: 4215991 Mt Surprise REF

LABORATORY REPORT

NOTES:

LOR - Limit of Reporting.

Please note there was not enough <75um fraction of the sieving to carry out sedimentation on the samples.

Analysis Date: Between 5/11/09 **and** 11/11/09

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Appendix D

Flora species list

Species	Common name	Family	Abundance (DAFOR)
*Acacia farnesiana**	Mimosa bush	Mimosaceae	R
Acacia leptostachya	Townsville wattle	Mimosaceae	O
Aristida sp.	Wire grass	Poaceae	F
Brachychiton australis	Broad-leaved bottle tree	Sterculiaceae	O
Bursaria incana	Prickly pine	Pittosporaceae	F
Callitris intratropica	Native cypress	Cupressaceae	R
Canarium australianum var. *australianum*	Canarium	Burseraceae	O
Capparis canescens	Wild orange	Capparaceae	O
Cochlospermum gillivraei	Kapok	Cochlospermaceae	F
Corymbia confertiflora	Broad-leaved carbeen	Myrtaceae	F
Corymbia erythrophloia	Red bloodwood	Myrtaceae	A
*Cryptostegia grandiflora** (C2)	Rubber vine	Apocynaceae	O
Cymbopogon bombycinus	Silky oilgrass	Poaceae	O
Drypetes deplanchei	Yellow tulipwood	Putranjivaceae	O
Elaeodendron melanocarpum	Black olive plum	Celastraceae	R
Enneapogon lindleyanus	Purple-headed nine awn	Poaceae	O
Erythroxylum australe	Turkey bush	Erythroxylaceae	O
Eucalyptus chartaboma	Darwin woollybutt	Myrtaceae	D-F
Eucalyptus crebra	Narrow-leaved ironbark	Myrtaceae	D
Ficus rubiginosa	Rusty fig	Moraceae	R
Geitonoplesium cymosum	Scrambling lily	Hemerocallidaceae	R

Grevillea glauca	Bushman's clothes pegs	Proteaceae	F
Grevillea mimosoides		Proteaceae	O
Heteropogon contortus	Black spear grass	Poaceae	A
Larsenaikia ochreata	Native gardenia	Rubiaceae	F
Lomandra longifolia	Matt rush	Laxmanniaceae	O
Melinis repens	Red Natal grass	Poaceae	A
Panicum decompositum var. *decompositum*	Native millet	Poaceae	O
Persoonia falcata	Geebung	Proteaceae	F
Petalostigma banksii	Smooth leaved quinine	Picrodendraceae	F
Petalostigma pubescens	Quinine bush	Picrodendraceae	A
Planchonia careya	Cocky apple	Lecythidaceae	F
Pouteria sericea	Wild prune	Sapotaceae	O
Psydrax odorata form *australiana*	Shiny leaved canthium	Rubiaceae	O
Siphonodon australis	Ivorywood	Celastraceae	R
Stylosanthes sp.	Stylo	Fabaceae	O
* = exotic; C2 = class 2 declared weed; C3 = class 3 declared weed			

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