Appendix D

Geotechnical Investigation, Soil Resistivity and ASS Reports

Australian Soil And Concrete Testing P/L

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REPORT ON GEOTECHNICAL INVESTIGATION PROPOSED ZONE SUBSTATION YAEGERS LANE BYRON BAY

FOR : TRICEND / MWH
BYRON BAY NSW 2481

9TH APRIL 2008
REF No : 1234-001-001

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Australian Soil And Concrete Testing P/L

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9th April 2008
Ref No : 1234 - 001 - 001

Country Energy.
c/- Tricend / MWH
Byron Bay NSW 2481

GEOTECHNICAL REPORT & LOT CLASSIFICATION
RE : Proposed Zone Substation - Site 7
AT : Yaegers Lane, Byron Bay

Introduction :

This report presents the results of site inspection, investigation and testing performed by Australian Soil & Concrete Testing Pty Ltd for a proposed zone substation at Site 7 Yaegers Lane, Byron Bay.

Inspection & Testing Procedure :

The proposed substation site is located in an undeveloped rural paddock. The area is situated near the top of a small ridge or spur within a much larger valley. Access to the site is through the disused piggery land then through the adjoining paddocks and up the slope to the designated site. The proposed substation site is well grassed and contains an area of ferns to the west on the upslope side. The current investigation was to ascertain the soil profile and possible depth to bedrock in the building area and to determine the suitability of the insitu soil profile for the proposed access road to the substation development

The inspection was carried out by Brian Dick, Principal Geotechnical Officer of ASCT, with the site investigation and testing performed by experienced technical staff in accordance with the Australian Standards AS 1726 Site Investigations & AS 2870 Residential Slabs & Footings - Construction.

Investigation Procedure : Lot Classification

The field work for the investigation of the area consisted of 2 boreholes to 2.0 meters and 1 borehole to 5 meters and 3 penetrometer tests to 1.8 meters or refusal. Borehole 1 & 2 were undertaken in the proposed building area and borehole 3 was done at the rear of the piggery buildings in the natural between the two dams. The Investigation was carried out in accordance with Australian Standard AS 1726-1993 Site Investigation Code.

Results of Site Investigation :

The site investigation in the proposed substation area has shown the natural soil to be low to non reactive sand and gravely sand to 5 meters deep with the bearing capacity ranging from 100Kpa at 300mm below the surface to 300Kpa or greater bearing capacity from 1.5 meters below the surface for the proposed substation development. The natural soil at borehole 3 for the access road had 100Kpa bearing capacity from 300mm below the surface to 2 meters and was in a very moist condition.

Results of Lot Classification :

The investigation revealed consistent subsurface conditions across the proposed substation building area, a low to non plastic, sand and gravely sand for the full depth across the building envelope, bedrock was not encountered. The building envelope shall be classified as :
Class S : Slightly Reactive In accordance with the guidelines of AS 2870.

The bearing capacity of the subgrade in the both proposed building area and access road is :
100 kPa from 300mm below the surface for standard footing design and 300 kPa from 1.5 meter below for the substation. The access road had 100 kPa from 300mm below for the full depth of the soil profile.

The potential hazard classification of the site is : **Class C : Minor.** In accordance with the guidelines of Appendix E, Table 1 of AS 1726 and is assessed as stable and will not be effected by landslide or subsidence when the substation is constructed.

Conclusion :

The results of the geotechnical investigation and inspection for bedrock determination and bearing capacity have provided enough soil profile information for Australian Soil & Concrete Testing to confirm that the bedrock was not encountered within the proposed substation construction development area. The bearing capacity through the profile is increasing and improving with depth in the proposed zone substation area and the access road can be developed with the use of good engineering practice, suitable drainage and an appropriate footing system implemented for the implied loads.

Should you require any further assistance or advice, please do not hesitate to call myself.

Yours faithfully,
Australian Soil & Concrete Testing Pty Ltd

Brian Dick
Managing Director

Report on Soil Penetration Resistance

Client : Tricend / MWH	**Project no** : 1234 - 001	**Project:** Yaegers Lane, Byron Bay
Test methods: AS 1289 6.3.2	**Report no** : 1234 - 001- 001	**Date Tested :** 28/3/08
Lab No : 8782	**Layer:** Subgrade – Natural	**Test location:** Proposed Zone Substation

Test 1

Depth below surface at commencement of test: 0 **mm**

Graduation Interval mm	Cumulative depth m	No. of Blows Required	Soil Description	Moisture Condition
300	0.30	4	Sand : dark brown grey Topsoil / Sand : pale grey	Moist
300	0.60	17	Sand : pale grey white	"
300	0.90	16	"	"
300	1.20	23	"	"
300	1.50	45/100	Gravely Sand : brown	"
300	1.80	Refusal	"	"
300	2.10			

Test 2

Depth below surface at commencement of test: 0 **mm**

Graduation Interval Mm	Cumulative depth m	No. of Blows Required	Soil Description	Moisture Condition
300	0.30	6	Sand : dark grey brown Topsoil / Sand : pale grey white	Moist
300	0.60	18	Sand : pale grey white	"
300	0.90	28	"	"
300	1.20	34	"	"
300	1.50	23	Gravely Sand : brown	"
300	1.80	21	"	"
300	2.10			"

Test 3

Depth below surface at commencement of test: 0 **mm**

Graduation Interval Mm	Cumulative depth m	No. of Blows Required	Soil Description	Moisture Condition
300	0.30	9	Sandy Clayey Silt : brown Topsoil / Sandy Silty Clay : brown	Moist
300	0.60	11	Sandy Silty Clay : brown	V. Moist
300	0.90	6	"	"
300	1.20	6	"	"
300	1.50	7	"	"
300	1.80	8	"	"
300	2.10			

Test

Depth below surface at commencement of test: 0 **mm**

Graduation Interval mm	Cumulative depth m	No. of Blows Required	Soil Description	Moisture Condition
300	0.30			
300	0.60			
300	0.90			
300	1.20			
300	1.50			
300	1.80			
300	2.10			

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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

Signed: _____ Date 30/04/2008

Brian Dick

(Approved Signatory)

BOREHOLE LOG REPORT

Client : Tricend / MWH	**Project No :** 1234- 001	**Project :** Yaegers Lane, Byron Bay
Lab No : 8782	**Report No :** 1234-001-001	**Borehole No:** 1

Borehole Inclination :90º	**Borehole Direction :** Vertical	**Date drilled :** 28/3/08
Surface Elevation : NA	**Borehole location :** Proposed Substation Area - Site 7	**Drill type :**Yanmar Drill Rig
Drilling Method : 90mm Auger		

TEST DATA

Soil Description	Depth (M)	Slope %	Graphic Symbol	Group Symbol	Consistency /Strength	Sample
SAND TOPSOIL : dark brown grey, non plastic, low dry strength, some medium to fine sand poorly graded, very loose, some organic matter, moist.	0.2			SP	VL	
SAND : pale grey white, non plastic, low dry strength, fine grained poorly graded, some fine gravel, medium dense, moist.	1.2			SP	MD	
GRAVELY SAND : brown, non plastic, low dry strength, coarse to fine sand well graded, fine gravel, medium dense to dense, moist.	2.0			SW	MD/D	
Stopped No Change						

BOREHOLE LOG REPORT

Client : Tricend / MWH	**Project No :** 1234- 001	**Project :** Yaegers Lane, Byron Bay
Lab No : 8782	**Report No :** 1234-001-001	**Borehole No:** 2

Borehole Inclination :90º	**Borehole Direction :** Vertical	**Date drilled :** 28/3/08
Surface Elevation : NA	**Borehole location :** Proposed Substation Area - Site 7	**Drill type :**Yanmar Drill Rig
Drilling Method : 90mm Auger		

TEST DATA

Soil Description	Depth (M)	Slope %	Graphic Symbol	Group Symbol	Consistency /Strength	Sample
SAND TOPSOIL : dark brown grey, non plastic, low dry strength, some medium to fine sand poorly graded, loose, some organic matter, moist.	0.15			SP	L	
SAND : pale grey white, non plastic, low dry strength, fine grained poorly graded, some fine gravel, medium dense, dry to moist.	1.2			SP	MD	
GRAVELY SAND : brown, non plastic, low dry strength, coarse to fine sand well graded, fine gravel, medium dense to dense, moist.	2.0			SW	MD/D	
	4.0					
Stopped No Change	5.0					

BOREHOLE LOG REPORT

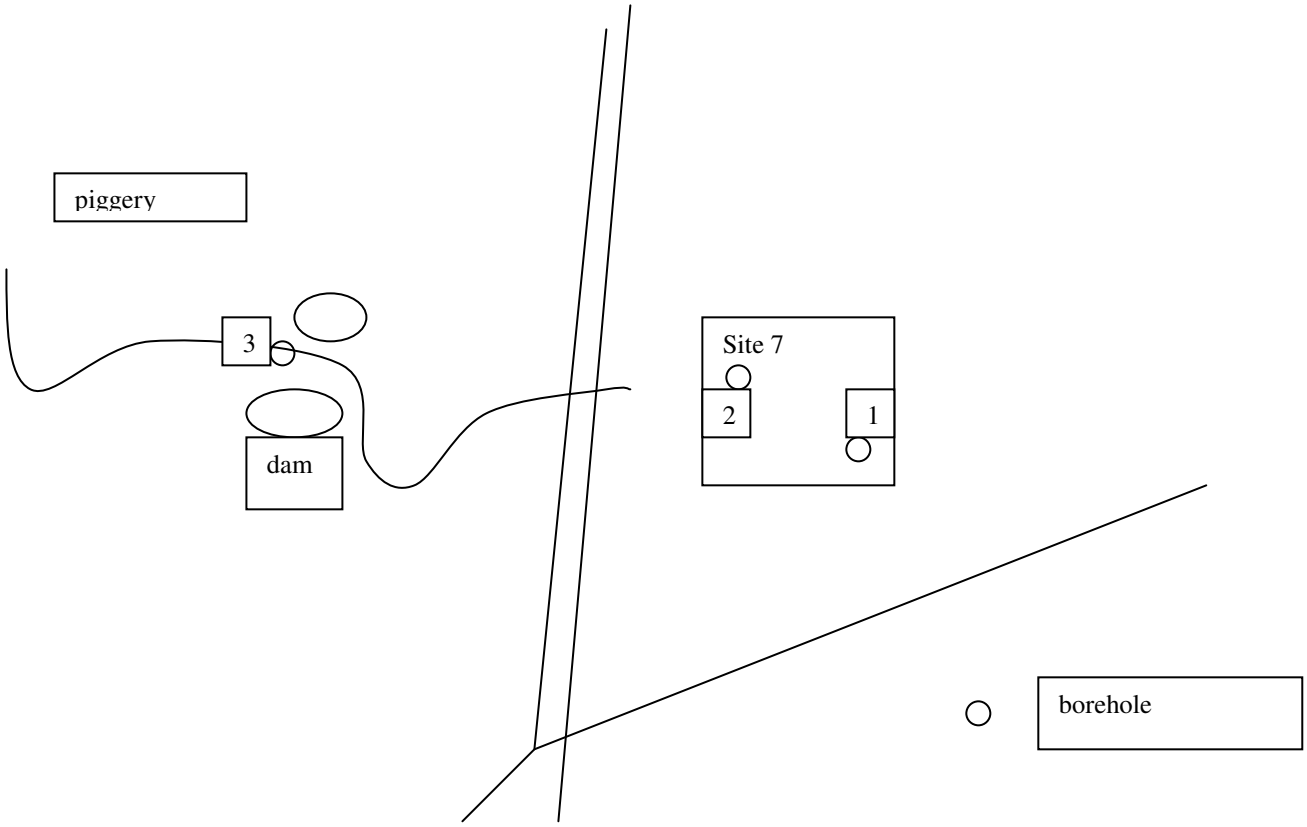
Client : Tricend / MWH	**Project No :** 1234- 001	**Project :** Yaegers Lane, Byron Bay
Lab No : 8782	**Report No :** 1234-001-001	**Borehole No:** 3

Borehole Inclination :90º	**Borehole Direction :** Vertical	**Date drilled :** 28/3/08
Surface Elevation : NA	**Borehole location :** Proposed Access Road - Site 7	**Drill type :**Yanmar Drill Rig
Drilling Method : 90mm Auger		

TEST DATA

Soil Description	Depth (M)	Slope %	Graphic Symbol	Group Symbol	Consistency /Strength	Sample
SAND CLAYEY SILT TOPSOIL : brown, low plastic, low dry strength, fine sand, firm, some organic matter, moist to very moist.	0.15			ML	F	
SAND SILTY CLAY : brown, medium plastic, medium dry strength, coarse to fine sand, some fine gravel, firm, very moist.				CL	F	
	1.0					
Stopped No Change	2.0					

PLAN OF TEST LOCATIONS



Acid Sulfate Soil Investigation

For

Proposed Power Substation Site
Yagers Lane (site 7),
Byron Bay, NSW

Prepared for: **Tricend**

Prepared by: **Australian Soil and Concrete Testing P/L**
7/17 Southern Cross Drive, Ballina, NSW, 2478

A.B.N. **49 050 539 930**

Email: asct@bigpond.com.

Reference: **1234 – 001**

Date: **10th April, 2008**

Table of Contents

1 Introduction

Australian Soil and Concrete Testing Pty Ltd (ASCT) have undertaken an Acid Sulfate Soil Investigation for a proposed power substation development site located at Yagers Lane (site 7), Byron Bay, NSW.

The broad aim of the Acid Sulfate Soil Investigation is to determine whether acid sulfate soil (ASS) is present at the site. If so, the extent, severity and type of ASS would also need to be determined. Furthermore, the investigation aims to determine the liming rate required to neutralise ASS should it be present at the site.

2 Acid Sulfate Soil

2.1 Background

ASS typically occurs in low-lying coastal areas. Developments involving excavation or lowering of the water table may result in the oxidation of sulfur (predominately in the form of pyrite) contained within these soils and the subsequent generation of acid discharge from the soil. The resultant discharge may find its way into the groundwater or stormwater and eventually into natural aquatic environments. The acidic run-off may lower the pH of the receiving water system, increase the concentration of metals and reduce the natural buffering capacity of the receiving waters.

There are two basic types of ASS. Actual Acid Sulfate Soils (AASS) are soils where the pyrites have been oxidised and sulfuric acid is present. Potential Acid Sulfate Soils (PASS) have not been oxidised and sulfuric acid has not yet been generated.

PASS in anaerobic conditions such as below the water table do not present an environmental hazard. However, if conditions change from anaerobic to aerobic, the pyrite in PASS will oxidise to form sulfuric acid. Oxidation can occur by either lowering the water table or removing the soil from below the water table, such as excavation.

2.2 ASS Management Principles and Guidelines

The following principles are in accordance with the ASSMAC Management Guidelines (1998) and are the fundamental strategies that underpin the management of ASS.

2.2.1 Avoidance

This is the soundest strategy and the proposed works should always attempt to modify work practices in order to avoid unnecessarily exposing or disturbing ASS. The proposed works should also where possible avoid activities that result in the fluctuation of the groundwater, in particular the lowering of groundwater.

2.2.2 Minimisation

Appropriate handling techniques and treatment of excavated soil are to be used to minimise and or prevent the disturbance of ASS. Furthermore, earthworks activities should be managed to minimise or mitigate the potential of ASS to impact on the surrounding environment.

2.2.3 Neutralisation

Sufficient neutralising agent should be incorporated into excavated soils in order to neutralise acid that is generated over time due to the gradual oxidation of ASS. Neutralising agent should also be applied to acidified water run-off and any remaining water ‘in-situ’ (within the pore spaces of the material being excavated) that has become acidified.

The management and remediation of the excavated soil for earth works will usually be achieved using a combination of the management strategies outlined above.

3 The Site

3.1 Site Description

The site is located near the top of a knoll in an undeveloped coastal/rural area. The site is currently accessed via cleared, well grassed grazing paddocks that adjoin Yagers Lane. There are no established tracks and the ground surface contains minor undulations. The proposed building area is well grassed and contains some small shrubs, principally ferns. The ground surface slopes approximately 7 % north-north east.

3.2 Soils

The soil at the site generally consists of non-reactive sand and gravely sand. The watertable was also found to exist from 1.9 m below the ground surface. The complete geotechnical borehole logs have been included in the geotechnical report compiled by ASCT (reference number: 1234 – 001).

4 The Investigation

4.1 Scope of Work

The scope of work for the Acid Sulfate Soil Investigation included:

- Drilling of three boreholes at the proposed development site.
- Collection of soil samples from the boreholes at 0.5 m intervals to a depth of 1.5 m.
- Analysis of all samples for field pH (pH_f) and field peroxide pH (pH_{fox}) to provide initial indication of PASS/AASS.
- Laboratory analysis of soil to determine % chromium reducible sulfur ($\%S_{cr}$), total actual acidity (TAA), net acidity and liming rates.
- Summary of ASS Analysis results.

4.2 Soil Sampling

Soil Sampling was conducted in accordance with the ASSMAC guidelines (1998) and included:

- The drilling of two boreholes in the building area of the proposed development site and one borehole in the location of the access road to the proposed development site. The borehole locations are displayed in figure 1.
- Sampling was undertaken by staff of ASCT, namely by Ben Hart (B. App. Sc.) and Matthew Hart (Geotechnician).
- Three soil samples were collected from each borehole at 0.5 m, 1.0 m and 1.5 m below the ground surface. Therefore, a total of nine soil samples were collected from the site.
- The drilling was conducted with a truck mounted drill rig (Yanmar 35) using solid flight augers and the samples were collected directly from the augers. The sampling augers were washed with clean water between each sample and sampling location.
- Samples were placed in zip lock plastic bags and transferred immediately to an esky with ice for storage. Samples were stored on ice before being tested the same day for field pH (pH_f) and field peroxide pH (pH_{fox}) in accordance with ASSMAC test method codes 21Af and 21Bf respectively. Furthermore, pH_{fox} testing was carried out using 30 % hydrogen peroxide adjusted to pH 5.5.
- On the basis of field testing, one sample was selected to be tested for % chromium reducible sulfur ($\%S_{cr}$ – Method 22B), total actual acidity (TAA), net acidity and liming requirements. These samples were transferred under ASCT's chain of custody conditions to the Environmental Analysis Laboratory (EAL), Lismore for analysis. The chain of custody documentation has been included in Appendix B of this report.

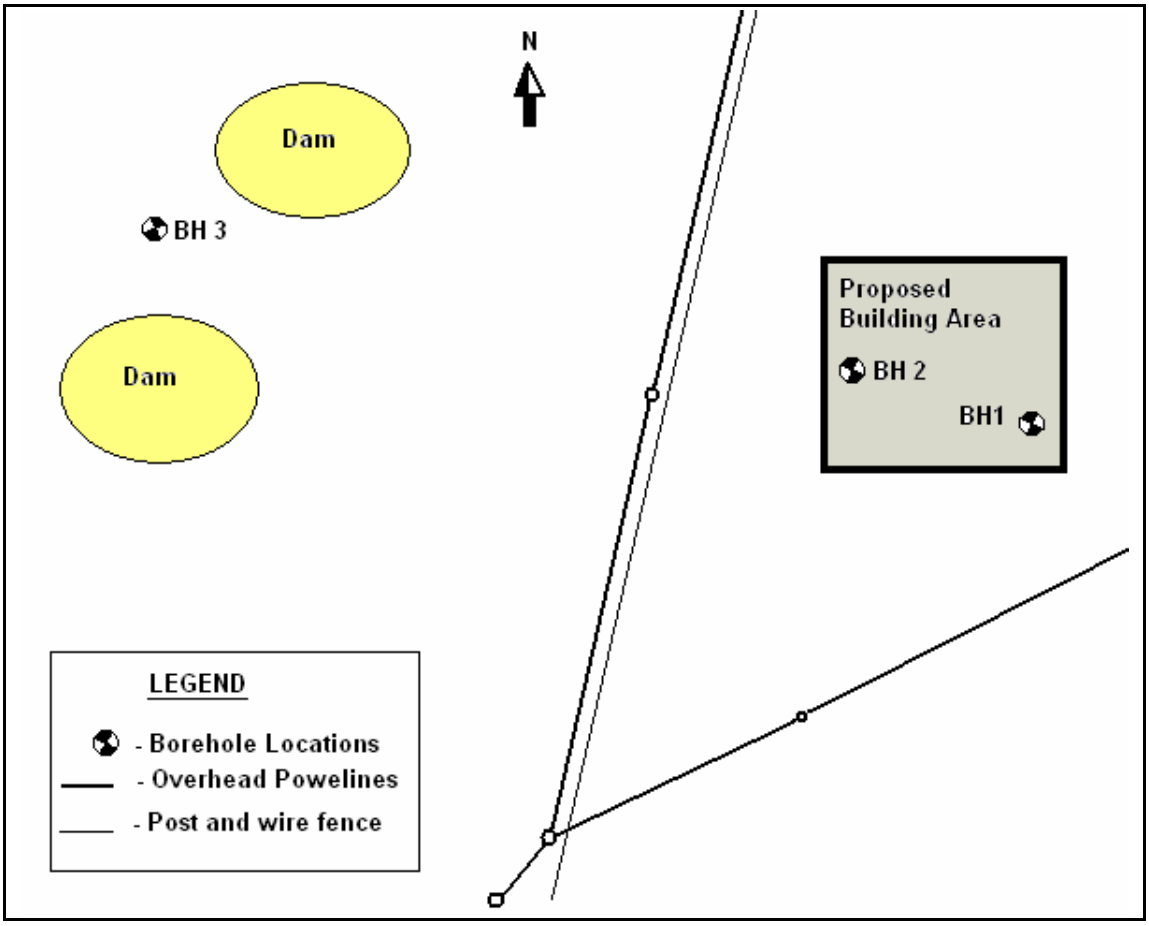


Figure 1: Plan of the proposed substation site at Yagers Lane, Byron Bay, showing the borehole locations.

5 Results

5.1 Field Testing

A summary of the field testing results is displayed in table 1. The field testing results indicate that the site may contain PASS, with samples from borehole 2 showing significant reactions with hydrogen peroxide. Furthermore, the results indicate that AASS is not present at the site. On the basis of the field testing results, sample number 6 was submitted for full laboratory analysis.

Table 1: Field testing summary.

Sample Number	Sample Source	Sample Depth (m)	pH_f	pH_{fox}	$pH_f - pH_{fox}$	PASS/AASS Indication*
1	**BH 1**	0.5	4.51	4.03	0.48	PASS unlikely
2	**"**	1.0	5.13	4.50	0.63	PASS unlikely
3	**"**	1.5	4.86	4.16	0.70	PASS unlikely
4	**BH2**	0.5	5.73	4.31	**1.42**	Possible PASS
5	**"**	1.0	5.80	4.24	**1.56**	Possible PASS
6	**"**	1.5	4.70	**3.45**	**1.25**	Possible PASS
7	**BH3**	0.5	6.06	5.40	0.66	PASS unlikely
8	**"**	1.0	5.80	5.32	0.48	PASS unlikely
9	**"**	1.5	5.49	5.11	0.38	PASS unlikely

* Indications are based on the ASSMAC guidelines and are determined as follows:

- PASS unlikely if → $pH_f - pH_{fox} < 1.0$
- Possible PASS if → $5 < pH_{fox} > 3$, or $pH_f - pH_{fox} > 1.0$
- PASS very likely if → $pH_{fox} < 3.0$, or $pH_f - pH_{fox} > 1.5$
- AASS present if → $pH_f < 4.0$

The field peroxide test is only an indicative test that is used to guide the selection of laboratory test samples. Furthermore, the test is least reliable in the sandy soil types that were encountered at the Yagers Lane site. Care must be taken when interpreting the reaction in these soils types as organic matter and other constituents such as manganese oxide can also cause a reaction.

5.2 Laboratory Testing

A summary of the laboratory results is displayed in table 2 and the complete results have been included in Appendix A. The laboratory testing provides more reliable results than the field testing and the ASS classifications of the laboratory samples are based on the following:

- Non-Potential Acid Sulfate Soils (Non PASS/AASS) – Laboratory testing indicates these soils have a net acidity below the ASSMAC action criteria and are not considered to present an environmental hazard.
- Potential Acid Sulfate Soils (PASS) – Laboratory testing indicates these soils have net acidity above the ASSMAC action criteria they may generate sulfuric acid and may present an environmental hazard. Management of these soils will be required.
- Actual Acid Sulfate Soils (AASS) – Laboratory testing indicates that these soils are actual acid sulfate when total actual acidity (TAA) is $pH_{KCl} < 4.0$. These soils may leach acid and will require management.

Table 2: Summary of laboratory test results

Sample Location	Depth (m)	TAA (pH_{KCl})	% Chromium Reducible Sulfur ($\%S_{cr}$)	Net Acidity mole H^+/tonne	Action Criteria* mole H^+/tonne	Acid Sulfate Potential	Lime Rate $kgCaCo_3/m^3$
BH2	1.5	5.38	<0.005	8	18	Non PASS/ASS	1

* Action criteria taken from the ASSMAC guidelines and is based on more than1000 tonnes of soil to be disturbed.

Laboratory analysis showed that the test sample had a net acidity below the ASSMAC action criteria. Therefore, on the basis of the laboratory testing the site can be classified as having Non-Potential Acid Sulfate Soils (Non-PASS). Laboratory testing also confirms there is no AASS at the site.

The laboratory analysis has also determined a liming application rate (with a safety factor of 1.5) based on the results of testing. The recommended liming rate is 1 kg $CaCo_3$ (lime)/m^3 of soil.

6 Acid Sulfate Soil Summary

The field and laboratory testing together with the general site information have enabled the following conclusions to be made:

- Soil from the site was found to have a net acidity below the ASSMAC action criteria and can be classified as Non-PASS/AASS. Non-PASS/AASS are not considered to present an environmental hazard.
- Laboratory testing has determined a recommended liming rate of 1 kg $CaCo_3$ (lime)/m^3 of soil, however this may be considered optional given that the net acidity of the soil is below the ASSMAC action criteria.

7 Limitations

This report relies on information supplied by the client and the results of investigations conducted in accordance with accepted practices and standards. The report is intended to represent a reasonable interpretation of the appropriate legislation and the condition of the site at the time of the investigation. However, due to these elements being subject to change over time the report under no circumstances can be considered to represent the definitive state of the site at all times.

Finally, should any problem or concern arise that needs clarification or assistance the client should not hesitate to contact this office.

Yours Faithfully,
Australian Soil and Concrete Testing Pty. Ltd.

Ben Hart
Environmental Officer
B. App. Sc

Brian Dick
Managing Director

8 References

DPI Qld, 2003. *Acid Sulfate Soils Laboratory Methods Guidelines*.

Stone, Y, Ahern C R, and Blunden B (1998). *Acid Sulfate Soils Manual 1998. Acid Sulfate Soil Management Advisory Committee* (ASSMAC), Wollongbar, NSW, Australia.

RESULTS OF ACID SULFATE SOIL ANALYSIS (Page 1 of 1)

1 sample supplied by Australian Soil and Concrete Testing on 31st March 2008 - Lab. Job No. E9062
Analysis requested by Brian. - **Your Project: Substations, Yaegers Lane, Byron Bay (PRO#1234-001)**

Sample Site	EAL lab code	Texture (note 6)	Moisture Content (% moisture)	Lab. Bulk Density tonne DW/m^3	TAA pH_{kcl}	Titratable Actual Acidity (TAA) mole H$^+$/tonne (to pH 6.5)	Reduced Inorganic Sulfur (% chromium reducible S) (%Scr) (note 2)	Reduced Inorganic Sulfur (Scr) mole H$^+$/tonne	NET ACIDITY Chromium Suite mole H$^+$/tonne (based on %Scrs)	LIME CALCULATION Chromium Suite kg CaCO$_3$/m^3 (includes 1.5 safety Factor)
Method No.					*23A*	*23F*	*22B*	*a- 22B*	*note 5*	*note 5*
BH2	*E9062/1*	Coarse	7.3	2.0	5.38	8	<0.005	0	8	1

NOTE:

1 - All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)
2 - Samples analysed by SPOCAS method 23 (ie Suspension Peroxide Oxidation Combined Acidity & sulfate) and 'Chromium Reducible Sulfur' technique (Scr - Method 22B)
3 - Methods from Ahern, CR, McElnea AE , Sullivan LA (2004). *Acid Sulfate Soils Laboratory Methods Guidelines.* QLD DNRME.
4 - Bulk density was determined immediately on arrival to laboratory (insitu bulk density is preferred)
5 - ABA Equation: Net Acidity = Potential Sulfidic Acidity (ie. Scrs or Sox) + Actual Acidity + Retained Acidity - measured ANC/FF
6 - For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays
7 - .. Denotes not requested or required
8 - CRS, TAA and ANC are NATA certified but other SPOCAS segments are currently not NATA certification
9- Results at of below detection limits are replaced with '0' for calculation purposes. CRS detection limit is 0.005%S.
10 - Projects that disturb >1000 tonnes of soil, the ≥0.03% S classification guideline would apply.

NATA

(Classification of potential acid sulfate material if: coarse Scr≥0.03%S or 19mole H+/t; medium Scr≥0.06%S or 37mole H+/t; fine Scr≥0.1%S or 62mole H+/t)

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checked: ....

AUSTRALIAN SOIL AND CONCRETE TESTING P/L A.B.N.49 050 539 930

E9062

Unit 7/17 Southern Cross Drive, P.O. Box 5120 Ballina NSW 2478. Telephone: 02 6686 8567, Fax: 02 6686 8396

ASCT Doc. No. A18 Rev. 03- 3/7/07 - CC

Laboratory Test Program

Client : TRICEND.	Project no : 1234 - 001	Project : SUBSTATIONS, YAEGERS LN, BYRON BAY
Location : PROPOSED SUBSTATION	Requested By: ASCT	Test methods :
Sampled By : BU / MH	Sample Type : SAND	Date Sampled : 28 · 3 · 08

Lab Sample No	Sample Source	Sample Description	Depth of Sample (m)	CRS SCREEN	LIME RATE														
8782	BH2	GRAVELY SAND/BROWN	1.5	\	\														

Comments

Signed: [signature] Date: 31/3/08
(Approved Signatory)

Signed:________________ Date:
(Receiving Authority)

Sampling performed at ASCT P/L Ballina
NATA Accredited Laboratory Number 3229

Page of

countryenergy

Suffolk Park
Soil Resistivity

Site 7
&
Site 12

31st January 2008

Conclusion:

Site 7. The first soil analysis was conducted in a North South traverse across the site indicating a multilayer soil structure when resolved to a three layer provided a match of measured to calculated results within a 10% accuracy. The soil structure for this traverse is a 340 Ω-m layer 5.5 metres thick with a middle layer of 120 Ω-m soil for 7 metres before becoming increasingly resistive to 600 Ω-m infinitely.

Traverse two conducted East West across the site indicated quite different results with quite high resistance upper layers of 736 Ω-m for the 5.7 metre top layer with a 3142 Ω-m, 7 metre thick middle layer before decreasing to an infinite layer of 373 Ω-m. This second traverse intersected the ridge where traverse 1. was conducted extending down through quite swampy wet ground approximately 5 metes lower than the ridge line. The different results would indicate vertical stratification of the soil requiring further soil resistance testing to create a composite model for earthing system design. For the purpose of site selection this second traverse would provide a better indication of soil composition as earthworks would be expected to level the site removing the ridge to some extent.

Site 12. Due to the limited area only a 60 metre analysis could be performed across this site exhibiting a multilayer soil composition which resolved well to a three layer soil model. A 713 Ω-m 2.25 metre thick top layer with a 1305 Ω-m middle layer 8 metres thick before decreasing to an infinite thickness layer of 618 Ω-m soil provided a good match of results.

Earthing system design is aided by soil structures that exhibit conductive properties at the lower layers allowing fault current to be drawn away from the surface when returning to its source. Both site 7. (traverse 2) and site 12 have more conductive lower layers although each of these layers is quite resistive overall. Site 7. (traverse 2) is slightly more preferable from an earthing perspective as the lower layer appears to be a better conductive medium but considerable area may need to be secured for auxiliary earthing such as counterpoising if required on a solidly earthed system. Usually the distribution phase to earth fault level is the limiting design parameter which can be alleviated by neutral earthing reactors if site area is insufficient.

Comparing the soil composition characteristics of both sites a definitive influence on the selection decision isn't identified.

Site 7.

Suffolk Park Site 7. Soil Resistivity Traverses.

Spacing Metres	Apparent Resistivity Traverse 1.
0.5	386.74
1	347.81
2	293.11
4	306.41
6	319.69
8	273.88
10	219.78
20	254.76
30	299.66
40	419.02
60	449.24
80	447.58
100	484.76

Metric/Logarithmic X and Y

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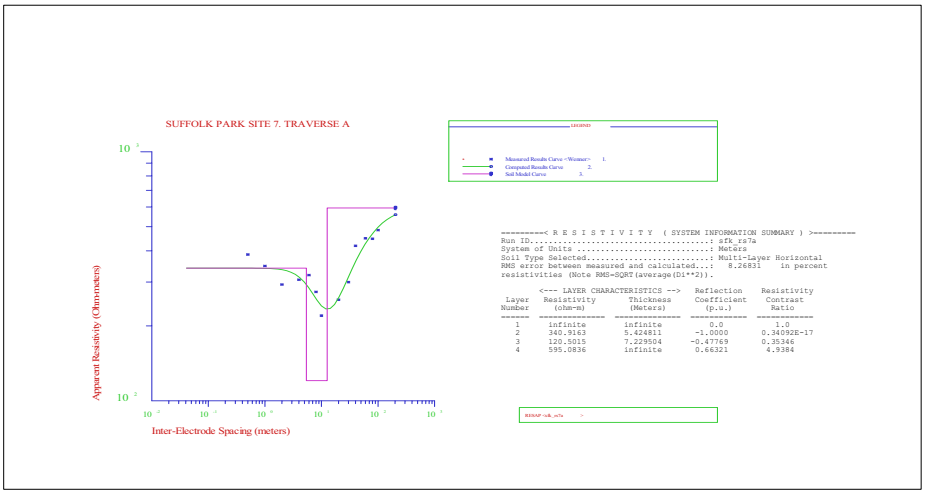

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Metric/Logarithmic X and Y

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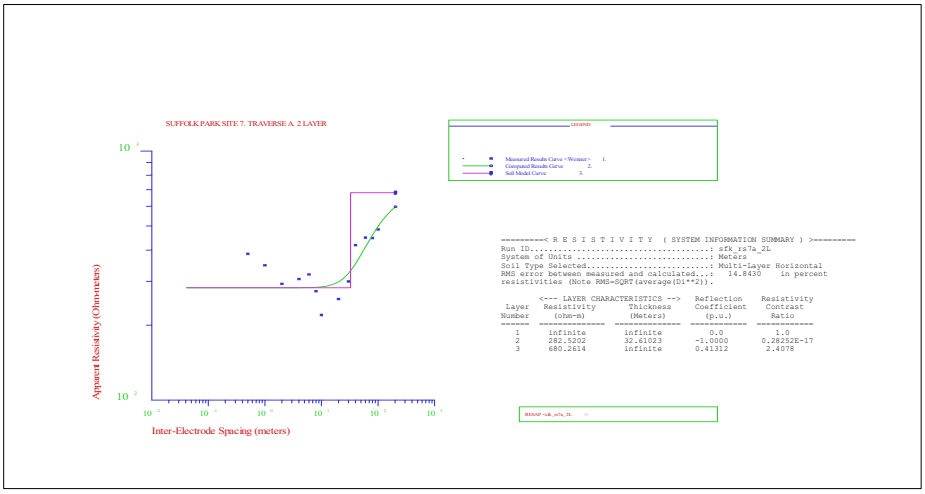

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Spacing Metres	Apparent Resistivity Traverse 2.
0.5	692.8
1	801.04
2	782.77
4	785.11
6	885.48
8	981.56
10	1065.69
20	1258.57
30	1052.43
40	830.88
60	474.19
80	470.45
100	462.2

Metric/Logarithmic X and Y

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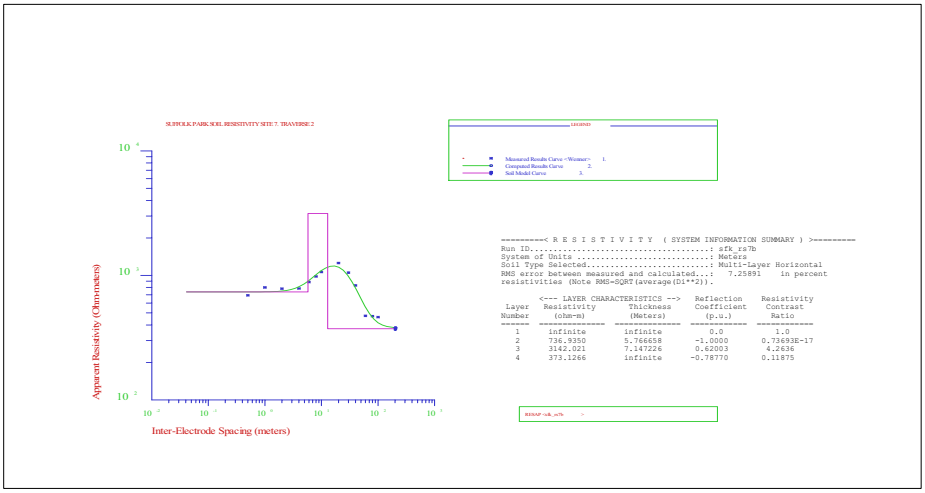

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Metric/Logarithmic X and Y

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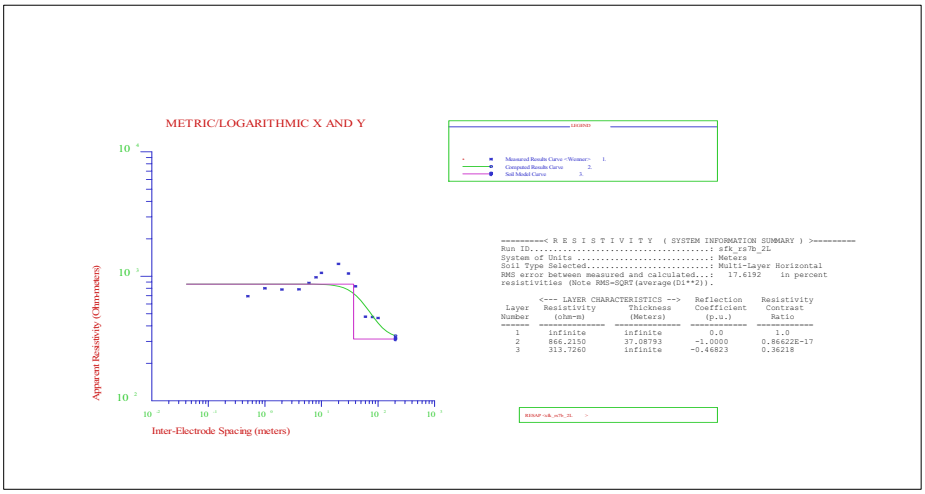

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Site 12.

Spacing Metres	Apparent Resistivity
0.5	687.32
1	775.84
2	761.24
4	903.48
6	1019.59
8	1049.36
10	995.21
20	929.1
30	774.25
40	667.77
60	681.33

Metric/Logarithmic X and Y

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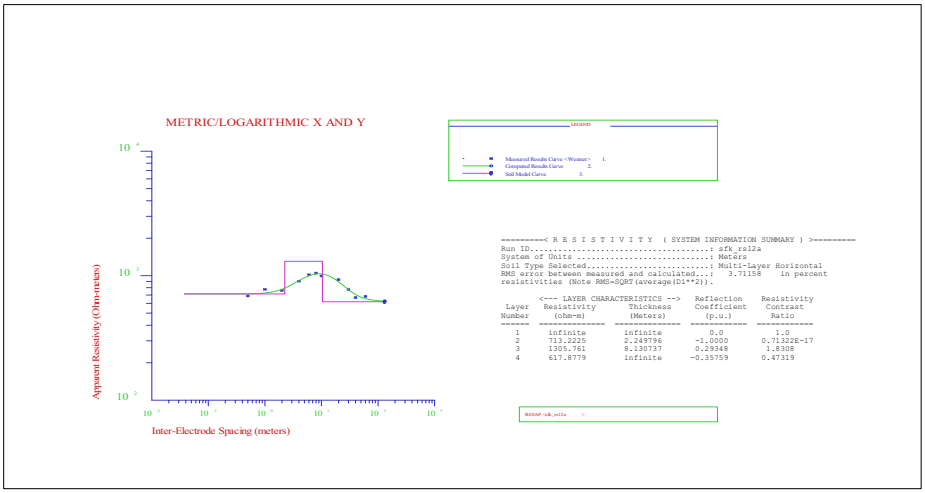

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Metric/Logarithmic X and Y

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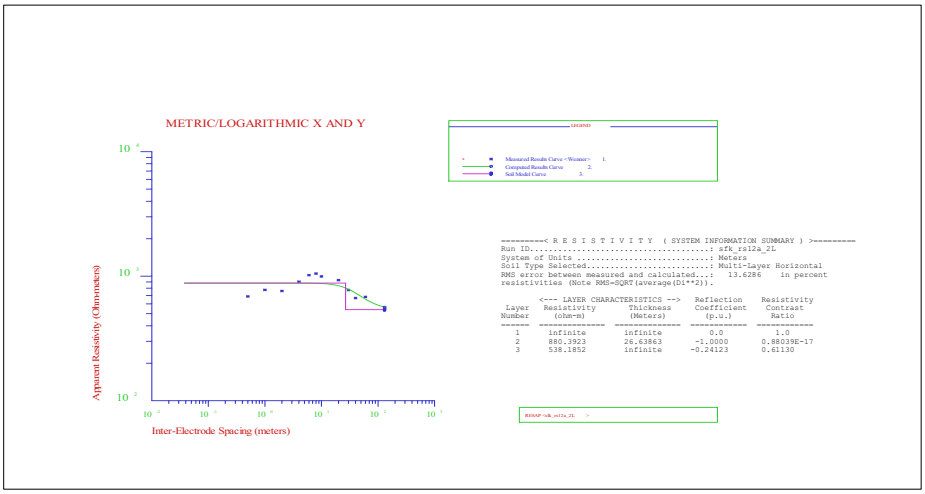

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Report #1:

=========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >=========

Run ID.....: sfk_rs7a
System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 8.26831 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

<--- LAYER CHARACTERISTICS -->			Reflection	Resistivity
Layer Number	Resistivity (ohm-m)	Thickness (Metres)	Coefficient (p.u.)	Contrast Ratio
1	infinite	infinite	0.0	1.0
2	340.9163	5.424811	-1.0000	0.34092E-17
3	120.5015	7.229504	-0.47769	0.35346
4	595.0836	infinite	0.66321	4.9384

End of Report #1

Report #2:

=========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >=========

Run ID.....: sfk_rs7a_2L
System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 14.8430 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

<--- LAYER CHARACTERISTICS -->			Reflection	Resistivity
Layer Number	Resistivity (ohm-m)	Thickness (Metres)	Coefficient (p.u.)	Contrast Ratio
1	infinite	infinite	0.0	1.0
2	282.5202	32.61023	-1.0000	0.28252E-17
3	680.2614	infinite	0.41312	2.4078

End of Report #2

Report #3:

=========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >=========

Run ID.....: sfk_rs7b
System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 7.25891 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

<--- LAYER CHARACTERISTICS --> Reflection Resistivity

Layer Number	Resistivity (ohm-m)	Thickness (Metres)	Coefficient (p.u.)	Contrast Ratio
1	infinite	infinite	0.0	1.0
2	736.9350	5.766658	-1.0000	0.73693E-17
3	3142.021	7.147226	0.62003	4.2636
4	373.1266	infinite	-0.78770	0.11875

End of Report #3

Report #4:

==========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >==========

Run ID.....: sfk_rs7b_2L
System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 17.6192 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

<--- LAYER CHARACTERISTICS --> Reflection Resistivity

Layer Number	Resistivity (ohm-m)	Thickness (Metres)	Coefficient (p.u.)	Contrast Ratio
1	infinite	infinite	0.0	1.0
2	866.2150	37.08793	-1.0000	0.86622E-17
3	313.7260	infinite	-0.46823	0.36218

Report #12:

==========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >==========

Run ID.....: sfk_rs12a_2L
System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 13.6286 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

<--- LAYER CHARACTERISTICS --> Reflection Resistivity

Layer Number	Resistivity (ohm-m)	Thickness (Metres)	Coefficient (p.u.)	Contrast Ratio
1	infinite	infinite	0.0	1.0
2	880.3923	26.63863	-1.0000	0.88039E-17
3	538.1852	infinite	-0.24123	0.61130

End of Report #13

Report #14:

==========< R E S I S T I V I T Y (SYSTEM INFORMATION SUMMARY) >==========

Run ID.....: sfk_rs12a_3L

System of Units .....: Metres
Soil Type Selected.....: Multi-Layer Horizontal
RMS error between measured and calculated...: 3.71158 in percent
resistivities (Note RMS=SQRT(average(Di**2)).

Layer Number	<--- LAYER CHARACTERISTICS --> Resistivity (ohm-m)	Thickness (Metres)	Reflection Coefficient (p.u.)	Resistivity Contrast Ratio
1	infinite	infinite	0.0	1.0
2	713.2225	2.249796	-1.0000	0.71322E-17
3	1305.761	8.130737	0.29348	1.8308
4	617.8779	infinite	-0.35759	0.47319

WARNING MORE THAN ONE SOIL MODEL CAN PRODUCE SIMILAR APPARENT RESISTIVITY MEASUREMENT CURVES. IF YOU USE THE DEFAULT STEEPEST-DESCENT METHOD, THEN YOU WILL MOST OFTEN OBTAIN DECENT AGREEMENT BETWEEN MEASURED VALUES AND THE COMPUTED CURVE, WITH A REALISTIC SOIL MODEL; HOWEVER, THE FIT MAY OCCASIONALLY BE SUB-OPTIMAL. IN SUCH CASES, THE MARQUARDT METHOD WILL USUALLY YIELD AN EXCELLENT FIT, BUT MAY SOMETIMES SUGGEST EXTREME RESISTIVITY VALUES. NOTE THAT DIFFERENT SOIL MODELS WILL USUALLY YIELD SIMILAR RESULTS FOR YOUR GROUNDING SYSTEM MODELS (I.E., GPR, TOUCH & STEP VOLTAGES), PROVIDED THAT THE GROUNDING SYSTEM IS LOCATED CLOSE TO THE EARTH SURFACE. IF IN DOUBT, CHECK YOUR RESULTS WITH BOTH SOIL MODELS.

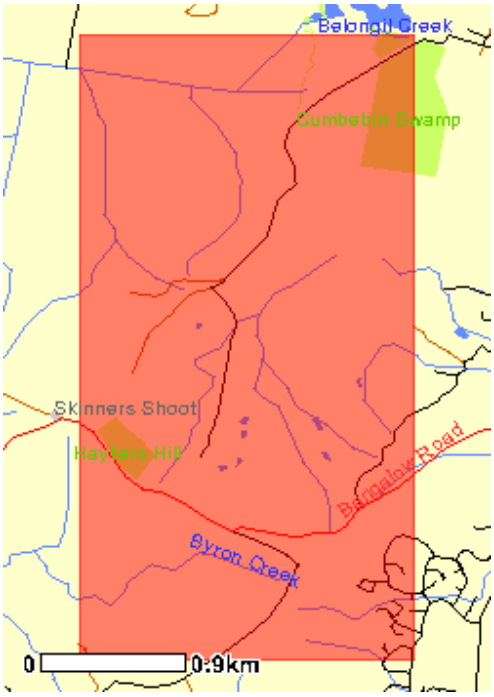
End of Report #14

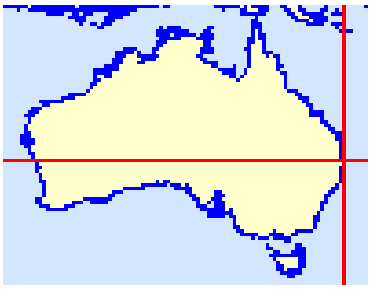
Appendix E

EPBC Protected Matters Report

EPBC Act Protected Matters Report

Search Type: Area
Buffer: 0 km
Coordinates: 153.57090, -28.68161, 153.61303, -28.65471





Summary
Matters of National Environmental Significance

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:	38
Migratory Species:	24

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.deh.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.deh.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	None
Listed Marine Species:	53
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:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	1

Details

Matters of National Environmental Significance

Threatened Species	Status	Type of Presence
Birds		
*Cyclopsitta diophthalma coxeni** Coxen's Fig-Parrot	Endangered	Species or species habitat likely to occur within area
Lathamus discolor * Swift Parrot	Endangered	Species or species habitat may occur within area
Macronectes giganteus * Southern Giant-Petrel	Endangered	Species or species habitat may occur within area
Macronectes halli * Northern Giant-Petrel	Vulnerable	Species or species habitat may occur within area
*Poephila cincta cincta** Black-throated Finch (southern)	Endangered	Species or species habitat likely to occur within area
*Pterodroma neglecta neglecta** Kermadec Petrel (western)	Vulnerable	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida * Campbell Albatross	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia * Regent Honeyeater	Endangered	Species or species habitat may occur within area

Frogs		
Litoria aurea *	Vulnerable	Species or species habitat may occur within area
Green and Golden Bell Frog		
Litoria olongburensis *	Vulnerable	Species or species habitat likely to occur within area
Wallum Sedge Frog		
Mammals		
Chalinolobus dwyeri *	Vulnerable	Species or species habitat may occur within area
Large-eared Pied Bat, Large Pied Bat		
*Dasyurus maculatus maculatus (SE mainland population)**	Endangered	Species or species habitat likely to occur within area
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)		
*Potorous tridactylus tridactylus**	Vulnerable	Species or species habitat may occur within area
Long-nosed Potoroo (SE mainland)		
Pteropus poliocephalus *	Vulnerable	Species or species habitat likely to occur within area
Grey-headed Flying-fox		
Reptiles		
Caretta caretta *	Endangered	Species or species habitat may occur within area
Loggerhead Turtle		
Chelonia mydas *	Vulnerable	Species or species habitat may occur within area
Green Turtle		
Dermochelys coriacea *	Vulnerable	Species or species habitat may occur within area
Leathery Turtle, Leatherback Turtle, Luth		
Snails, slugs		
Thersites mitchellae *	Critically	Species or species habitat likely to occur
Mitchell's Rainforest Snail	Endangered	within area
Plants		
Acronychia littoralis *	Endangered	Species or species habitat likely to occur within area
Scented Acronychia		
Cryptocarya foetida *	Vulnerable	Species or species habitat likely to occur within area
Stinking Cryptocarya, Stinking Laurel		
Davidsonia sp. Mullumbimby-Currumbin Ck (A.G.Floyd 1595) *	Endangered	Species or species habitat likely to occur within area
Desmodium acanthocladum *	Vulnerable	Species or species habitat likely to occur within area
Thorny Pea		
Diploglottis campbellii *	Endangered	Species or species habitat likely to occur within area
Small-leaved Tamarind		
Endiandra floydii *	Endangered	Species or species habitat likely to occur within area
Floyd's Walnut		
Endiandra hayesii *	Vulnerable	Species or species habitat likely to occur

Rusty Rose Walnut, Velvet Laurel		within area
Floydia praealta *	Vulnerable	Species or species habitat likely to occur within area
Ball Nut, Possum Nut, Big Nut, Beefwood		
Owenia cepiodora *	Vulnerable	Species or species habitat likely to occur within area
Onionwood, Bog Onion, Onion Cedar		
Phaius australis *	Endangered	Species or species habitat likely to occur within area
Lesser Swamp-orchid		
Randia moorei *	Endangered	Species or species habitat likely to occur within area
Spiny Gardenia		
Syzygium hodgkinsoniae *	Vulnerable	Species or species habitat likely to occur within area
Smooth-bark Rose Apple, Red Lilly Pilly		
Syzygium moorei *	Vulnerable	Species or species habitat likely to occur within area
Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple		
Tinospora tinosporoides *	Vulnerable	Species or species habitat likely to occur within area
Arrow-head Vine		

Migratory Species	**Status**	**Type of Presence**
Migratory Terrestrial Species		
Birds		
Cyclopsitta diophthalma coxeni	Migratory	Species or species habitat likely to occur within area
Coxen's Fig-Parrot		
Haliaeetus leucogaster	Migratory	Species or species habitat likely to occur within area
White-bellied Sea-Eagle		
Hirundapus caudacutus	Migratory	Species or species habitat may occur within area
White-throated Needletail		
Monarcha melanopsis	Migratory	Breeding may occur within area
Black-faced Monarch		
Monarcha trivirgatus	Migratory	Breeding likely to occur within area
Spectacled Monarch		
Myiagra cyanoleuca	Migratory	Breeding likely to occur within area
Satin Flycatcher		
Rhipidura rufifrons	Migratory	Breeding may occur within area
Rufous Fantail		
Xanthomyza phrygia	Migratory	Species or species habitat may occur within area
Regent Honeyeater		
Migratory Wetland Species		
Birds		
Gallinago hardwickii	Migratory	Species or species habitat may occur within area
Latham's Snipe, Japanese Snipe		
Rostratula benghalensis s. lat.	Migratory	Species or species habitat may occur within area
Painted Snipe		

Migratory Marine Birds

Macronectes giganteus Southern Giant-Petrel	Migratory	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel	Migratory	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross	Migratory	Species or species habitat may occur within area

Extra Information

State and Territory Reserves
Cumbebin Swamp Nature Reserve, NSW
Hayters Hill Nature Reserve, NSW
Regional Forest Agreements
Note that all RFA areas including those still under consideration have been included.
Upper North East NSW RFA, New South Wales

Department of the Environment and Heritage
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111

Appendix F

Observed Flora

Observed Flora Species

Special Status abbreviations are as follows:

New South Wales *Threatened Species Conservation Act 1995* (TSCA Status): U = Unprotected species, **E** = Endangered species

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Status): U = Unprotected species, **E** = Endangered species

Family	*Scientific name*	Common Name	TSCA	EPBC	Notes	Exotic
Apiaceae	*Centella asiatica*		U	U		
Apiaceae	*Hydrocotyle bonariensis*	Pennywort	U	U		X
Apocynaceae	*Parsonsia straminea*	Monkey Rope	U	U		
Araceae	*Alocasia brisbanensis*	Cunjevoi	U	U		
Araliaceae	*Polyscias elegans*	Celery Wood	U	U		
Araliaceae	*Schefflera actinophylla*	Umbrella Tree	U	U		
Araucariaceae	*Araucaria cunninghamii*	Hoop Pine	U	U		
Arecaceae	*Archontophoenix cunninghamiana*	Piccabeen Palm	U	U		
Asclepiadaceae	*Asclepias curassavica*	Red-Head Cottonbush	U	U		X
Asclepiadaceae	*Gomphocarpus fruticosus*	Narrow-Leaved Cotton Bush	U	U		X
Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern	U	U		X
Asteraceae	*Ageratina riparia*	Mistflower	U	U	Class 4 Weed	X
Asteraceae	*Ageratum houstonianum*	Blue Billygoat Weed	U	U		X
Asteraceae	*Baccharis halimifolia*	Groundsel Bush	U	U	Class 3 Weed	X
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	U	U		X
Asteraceae	*Chrysanthemoides monilifera*	Bitou Bush	U	U	Class 4 Weed	X
Asteraceae	*Conyza bonariensis*	Fleabane	U	U		X
Asteraceae	*Conyza sumatrensis*	Tall Fleabane	U	U		X
Asteraceae	*Crassocephalum crepidioides*	Thickhead	U	U		X
Asteraceae	*Hypochaeris glabra*	Smooth Catsear	U	U		X
Asteraceae	*Hypochaeris radicata*	Catsear	U	U		X

Family	*Scientific name*	Common Name	TSCA	EPBC	Notes	Exotic
Asteraceae	*Senecio madagascariensis*	Fireweed	U	U		X
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	U	U		X
Asteraceae	*Sphagneticola trilobata*	Singapore Daisy	U	U		X
Asteraceae	*Tagetes minuta*	Stinking Roger	U	U		X
Blechnaceae	*Blechnum nudum*	Fishbone Water Fern	U	U		
Blechnaceae	*Doodia caudata*	Ground Fern	U	U		
Buddlejaceae	*Buddleja madagascariensis*	Buddleia	U	U		X
Caesalpiniaceae	*Senna pendula*	Easter Cassia	U	U		X
Commelinaceae	*Commelina diffusa*	Wandering Jew	U	U		
Convolvulaceae	*Ipomoea cairica*	Mile-A-Minute	U	U		X
Cupressaceae	*Callitris columellaris*	Bribie Island Pine	U	U		
Cyperaceae	*Baumea articulata*	Jointed Twigrush	U	U		
Cyperaceae	*Cyperus difformis*	Rice Sedge	U	U		
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	U	U		
Dicksoniaceae	*Calochlaena dubia*	Soft Bracken	U	U		
Dilleniaceae	*Hibbertia scandens*	Climbing Guinae Flower	U	U		
Elaeocarpaceae	*Elaeocarpus obovatus*	Ash Quandong	U	U		
Euphorbiaceae	*Alchornea ilicifolia*	Native Holly	U	U		
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	U	U		
Euphorbiaceae	*Glochidion sumatranum*	Umbrella Cheese Tree	U	U		
Euphorbiaceae	*Macaranga tanarius*	Macaranga	U	U		
Euphorbiaceae	*Mallotus philippensis*	Red Kamala	U	U		
Fabaceae	*Desmodium rhytidophyllum*	Native Desmodium	U	U		
Fabaceae	*Glycine clandestina*	Native Glycine	U	U		
Fabaceae	*Hovea acutifolia*		U	U		
Fabaceae	*Trifolium repens*	White Clover	U	U		X
Fabaceae	*Vicia monantha*	Square-Stem Veitch	U	U		X
Goodeniaceae	*Goodenia rotundifolia*	Forest Goodenia	U	U		
Hemerocallidaceae	*Geitonoplesium cymosum*	Scrambling Lily	U	U		
Lauraceae	*Cinnamomum camphora*	Camphor Laurel	U	U	Class 4 Weed	X
Lauraceae	*Cinnamomum oliveri*	Oliver's Sassafras	U	U		X
Lauraceae	*Cryptocarya obovata*	Pepperberry	U	U		
Lauraceae	*Endiandra hayesii*	Rusty Rose Walnut	V	V		

Family	*Scientific name*	Common Name	TSCA	EPBC	Notes	Exotic
Lauraceae	*Litsea australis*	Brown Bolly Gum	U	U		
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	U	U		X
Menispermaceae	*Stephania japonica*	Snake Vine	U	U		
Mimosaceae	*Acacia melanoxylon*	Blackwood	U	U		
Mimosaceae	*Acacia sophorae*	Coastal Wattle	U	U		
Monimiaceae	*Wilkiea austroqueenslandica*	Smooth Wilkiea	U	U		
Moraceae	*Ficus coronata*	Creek Sandpaper Fig	U	U		
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	U	U		
Moraceae	*Ficus watkinsiana*	Green-Leaved Moreton Bay Fig	U	U		
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn	U	U		
Myrtaceae	*Austromyrtus dulcis*	Midgen Berry	U	U		
Myrtaceae	*Rhodamnia rubescens*	Malletwood	U	U		
Myrtaceae	*Syzygium australe*	Scrub Cherry	U	U		
Myrtaceae	*Syzygium francisii*	Giant Watergum	U	U		
Nephrolepidaceae	*Nephrolepis cordifolia*	Fishbone Fern	U	U		
Ochnaceae	*Ochna serrulata*	Ochna	U	U		X
Oleaceae	*Ligustrum sinense*	Small-Leaved Privet	U	U		X
Onagraceae	*Ludwigia octovalvis*	Willow Primrose	U	U		
Oxalidaceae	*Oxalis corniculata*	Wood Sorrel	U	U		
Passifloraceae	*Passiflora suberosa*	Corky Passion Flower	U	U		X
Phytolaccaceae	*Phytolacca octandra*	Inkweed	U	U		X
Pinaceae	*Pinus elliottii*	Slash Pine	U	U		X
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	U	U		
Poaceae	*Andropogon virginicus*	Whiskey Grass	U	U		X
Poaceae	*Chloris gayana*	Rhodes Grass	U	U		X
Poaceae	*Cynodon dactylon*	Coach Grass	U	U		X
Poaceae	*Eremochloa bimaculata*	Poverty Grass	U	U		
Poaceae	*Melinis minutiflora*	Molasses Grass	U	U		X
Poaceae	*Oplismenus hirtellus*	Pademelon Grass	U	U		
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	U	U		X
Poaceae	*Pennisetum setaceum*	Fountain Grass	U	U	Class 4 Weed	X

Family	*Scientific name*	Common Name	TSCA	EPBC	Notes	Exotic
Poaceae	*Setaria sphacelata*	Pigeon Grass	U	U		X
Poaceae	*Sporobolus pyramidalis*	Giant Rats-Tail Grass	U	U	Class 3 Weed	X
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	U	U		X
Poaceae	*Urochloa decumbens*	Signal Grass	U	U		X
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn Fern	U	U		
Polypodiaceae	*Platycerium superbum*	Staghorn Fern	U	U		
Polypodiaceae	*Pyrrosia rupestris*	Rock Felt Fern	U	U		
Proteaceae	*Banksia integrifolia*		U	U		
Rhamnaceae	*Alphitonia petriei*	Pink Ash	U	U		
Rosaceae	*Rubus parvifolius*	Pink-Flowered Native Raspberry	U	U		
Rutaceae	*Citrus x hybrida*	Citris	U	U		X
Sapindaceae	*Atalaya multiflora*	Broad-Leaved Whitewood	U	U		
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	U	U		
Sapindaceae	*Jagera pseudorhus*	Foam Bark	U	U		
Smilacaceae	*Smilax australis*	Barbed-Wire Vine	U	U		
Solanaceae	*Solanum americanum*	Glossy Nightshade	U	U		X
Solanaceae	*Solanum capsicoides*	Devil's Apple	U	U		X
Solanaceae	*Solanum mauritianum*	Wild Tobacco	U	U		X
Sterculiaceae	*Commersonia bartramia*	Brown Kurrajong	U	U		
Sterculiaceae	*Commersonia bartramia*	Brown Kurrajong	U	U		
Thymelaeaceae	*Wikstroemia indica*	Tie Bush	U	U		
Verbenaceae	*Lantana camara*	Lantana	U	U	Class 4 Weed	X
Vitaceae	*Cayratia clematidea*	Slender Grape	U	U		

Appendix G

Assessment of Significance

Appendix G. Threatened Species Assessment of Significance and EPBC Assessment

GREEN-LEAVED ROSE WALNUT *ENDIANDRA MUELLERI*

Background
Status: Endangered (Threatened Species Conservation Act 1995)

Description and Habitat: The Green-leaved Rose Walnut is a tree growing to 30m in height with buttressed roots and brown bark that often forms rounded plates. Leaves are usually 6–12 cm long and 3–5 cm wide, moderately glossy, brown or green when dried. The midrib is warty on the lower leaf surface. Small domatia are sometimes present and petiole approximate 5–10 mm in length. Flowers approximate 2 mm in length and are yellowish in colour (Harden 2008). Preferred habitat of this species consists of warm tropical and sub-tropical rainforest on poorer soils and in littoral rainforest on sands (Harden 2008).
Distribution: The Green-leaved Rose Walnut is distributed along the east coast of Australia, from the Allyne River in New South Wales, northward to Innisfail in Northern Queensland.
Threats: The primary threats to this species include clearing and fragmentation of habitat for coastal development, agriculture, road-works, infestation of habitat by weeds and frequent fire (DEC 2004).

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

A single specimen of the Green-leaved Rose Walnut is known to occur within vegetation associated with a drainage line to the east of site 7. However, vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already devoid of native vegetation. The powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation that currently provides habitat for this species. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (e.g. Camphor Laurel and/or Slash Pine). This will reduce the necessity for canopy trimming.
It is therefore considered that the proposed activities will not significantly affect the growth, survival or future recruitment of the species.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already devoid of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the power line will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree s may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Not applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The proposed action is consistent with the Approved NSW Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *Endiandra hayesii* (Rusty Rose Walnut) (DEC 2004).

References

DEC (2004). Recovery Plan for *Endiandra muelleri* subsp. *bracteata* (Green-leaved Rose Walnut) and *Endiandra hayesii* (Rusty Rose Walnut). Department of Environment and Conservation (NSW), Hurstville.

Harden, G. J. (2008). *Endiandra muelleri* species profile. New South Wales Flora Online. http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Endiandra~muelleri.

WHITE-EARED MONARCH *MONARCHA LEUCOTIS*

Background
Status: Vulnerable (Threatened Species Conservation Act 1995)

Ecology and Habitat: White-eared Monarchs inhabit coastal and near-coastal rainforests, but can occur in a variety of other habitats including regrowth forests and mangroves. They seem to be particularly associated with ecotones between rainforests and dry forests or along rainforest edges (Higgins *et. al.* 2006). Predominantly insectivorous, White-eared Monarchs glean prey from the outer foliage of small and large trees in the canopy or subcanopy. However, a large portion of prey are also apparently taken by sallying or flush-chasing (Higgins *et. al.* 2006).
They appear to have a complex movement pattern, with many pairs, particularly in northern Australia, resident throughout the year, while pairs in the south may return to the same location in consecutive years.
Distribution and Breeding: Within Australia, White-eared Monarchs may be found along the east coast from Iluka in NSW north to around Cooktown in QLD. Some individual records of the species have also been recorded from the Woolgoolga area.
Breeding generally occurs between September and March. Nests are located high in the canopy, often on the topmost or outermost foliage of trees and vines.

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No White-eared Monarchs have been recorded form the study area, but the species is known from the local area. Suitable habitat for the species is restricted to two small areas associated with gullies to the east of site 7 and west of site 12. These are minor in extent and it is highly unlikely that any resident birds will nest in these areas as the energetic expense of foraging wide distances from nest sites prohibit breeding success. However, it is possible that individual birds may use the area for foraging or dispersing from nearby large areas of suitable habitat, such as that associated with Skinners Shoot. Impacts are therefore restricted to the impact on foraging habitat. Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. This may results in canopy trimming of some emergent trees. The loss of this foliage is not considered likely to impact the local population or reduce the holding capacity of the local area. Furthermore, careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (e.g. Camphor Laurel and/or Slash Pine).
White-eared Monarchs are highly mobile animals, readily able to move through mosaic landscapes. The proposed activities will not therefore impacts dispersal or movement patterns of the local population.
The proposed activities will not significantly affect the roosting, breeding, foraging or movement patters of the species.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *iii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *iv) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- *v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- *vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

References
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BLACK FLYING-FOX *PTEROPUS ALECTO*

Background
Status: Vulnerable (Threatened Species Conservation Act 1995)

Ecology and Habitat: Black Flying-foxes generally roost in mangroves, swamps and other dense vegetation, forming large, permanent camps (i.e. thousands of individuals) that often contain several species, including Little Red Flying-fox *Pteropus scapulatus* and Grey-headed Flying-fox *P. poliocephalus* (Strahan 1995; Menkhorst and Knight 2004). They generally prefer to roost in an area that has a dense leaf cover in the canopy and prefer to feed on the blossoms of Eucalypts, paperbarks and Turpentines (Strahan 1995).

However, they will include other native and introduced species (i.e. mangoes) to their diet and are known to travel up to 50km for foraging (Strahan 1995).
Distribution and Breeding: This species is found in coastal areas of northern Australia (Strahan 1995; Menkhorst and Knight 2004). Black Flying-foxes mate in March and April and females usually give birth to a single young in October, although birthing has been known to take place anytime between August and November (Strahan 1995).
Threats: The main threats to this species include habitat loss (i.e. roosting areas and food trees), lead poisoning (possibly from vehicular emissions), weed invasion and persecution by humans (Low 1995). They are also frequently seen electrocuted on powerlines (Hall and Martin 1995).

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No Black Flying-fox camps are known to occur within vegetation in the study area and none are adjacent to existing vegetation. Breeding and care of young occur within roosts. Therefore, there are no expected impacts on the roosting or breeding requirements of the species.
Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. This may results in the loss of individual *Banksia integrifolia* that may be used as a foraging resource by the local population. However, this plant is common both in surrounding vegetation and within the local area. The loss of one or two trees is not considered likely to impact the local population or reduce the holding capacity of the local area.
Some trimming of emergent vegetation may also be required to ensure clear passage of the powerline easement over existing vegetation in gullies. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (eg, Camphor Laurel and/or Slash Pine). This will reduce the necessity for canopy trimming. Emergent figs and *B. integrifolia* are scattered within this community and the resultant trimming is likely to affect only a small number of trees. In the context of surrounding foraging resources, this loss is not likely to affect the local Black Flying-fox population.
Mortality due to electrocution is a known threat to Flying-fox individuals. However, the potential powerline easement from site 12 to existing powerline easements is no more than 700m in length. It is not expected that this small addition to existing powerline networks will significantly increase local population mortality.
Black Flying-foxes are highly mobile animals, readily crossing extensive areas of artificial and highly modified habitat. The activities will not therefore impacts dispersal or movement patterns of the local population.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *v) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *vi) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *vii) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- *viii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- *ix) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

References

Hall, LS and Martin, L (1995). 'Bats.' In: M Ryan (ed.), Wildlife of greater Brisbane. Queensland Museum, Brisbane. pp. 297-306.

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Menkhorst, PW and Knight, F (2004). A field guide to the mammals of Australia. Oxford University Press, Melbourne.

Strahan, R (ed.) (1995). The mammals of Australia. Reed Books, Sydney.

GREY-HEADED FLYING-FOX *PTEROPUS POLIOCEPHALUS*

Background
Status: Vulnerable (Threatened Species Conservation Act 1995); Vulnerable (Environment Protection and Biodiversity Conservation Act 1999)

Ecology and Habitat: Two habitat characteristics are important for Grey-headed Flying-foxes - foraging resources and roosting sites. As the species is a canopy-feeding frugivore and nectarivore, they utilise vegetation including rainforests, open eucalypt forests, woodlands, Melaleuca swamps and Banksia woodlands.
Roosts are commonly within dense vegetation close to water, primarily rainforest patches, stands of Melaleuca, mangroves or riparian vegetation (Nelson 1965), but colonies may use exotic vegetation in urban areas (Birt *et. al.* 1998). The species congregates in large camps of up to 200,000 individuals from early until late summer, with the number of bats within a camp being influenced by the availability of blossom in the surrounding area. Adults normally disperse during the winter and can migrate up to 750km as individuals or small groups, with the young forming winter camps (Churchill 1998).
Distribution and Breeding: Regular or frequently used camps have been located between Rockhampton in Queensland south to around Mallacoota in East Gippsland, Victoria. Less consistent records extend the south range of the species to Warrnambool, Victoria (Duncan *et. al.* 1999). They are generally recorded between the coast and the western slopes of the Great Dividing Range. Recent surveys have failed to locate camps or regular records of this species from the Rockhampton Area or north of Hervey Bay, Queensland. Furthermore, despite one regular camp in Melbourne (Menkhorst 1995), the southern range of the species has also appeared to have considerably retracted (Duncan *et. al.* 1999).
Breeding occurs during the spring months when food resources are at their most plentiful.
Threats: Grey-headed Flying-foxes are subject to several threatening processes, the most severe being loss of habitat. It has been suggested that this resulted in a 50% decline in the population by the 1930s (Duncan *et. al.* 1999). The loss of habitat, particularly important habitat such as reliable winter resources along the east coast, has continued to lead to population decline. The species will also forage within commercial fruit farms, sometimes significantly reducing their yield. This has resulted in direct culling or the destruction of camps by harassment. Other threatening processes include accumulation of lethal levels of lead in urban areas (Hariono *et. al.* 1993), electrocution on overhead powerlines, which kills disproportionately high numbers of lactating females (Duncan *et. al.* 1999), and conversion of old-growth forests and woodlands to young, even-aged stands due to too-frequent burning (NPWS 2002).

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No Grey-headed Flying-fox camps are known to occur within vegetation in the study area and non are adjacent to existing vegetation. Breeding and care of young occur within roosts. Therefore, there are no expected impacts on the roosting or breeding requirements of the species.
Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. This may results in the loss of individual *Banksia integrifolia* that may be used as a foraging resource by the local population. However, this plant is common both in surrounding vegetation and within the local area. The loss of one or two trees is not considered likely to impact the local population or reduce the holding capacity of the local area.
Some trimming of emergent vegetation may also be required to ensure clear passage of the powerline easement over existing vegetation in gullies. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (eg, Camphor Laurel and/or Slash Pine). This will reduce the necessity for canopy trimming. Emergent figs and *B. integrifolia* are scattered within this

community and the resultant trimming is likely to affect only a small number of trees. In the context of surrounding foraging resources, this loss is not likely to affect the local Grey-headed Flying-fox population. Mortality due to electrocution is a known threat to Flying-fox individuals. However, the potential powerline easement from site 12 to existing powerline easements is no more than 700m in length. It is not expected that this small addition to existing powerline networks will significantly increase local population mortality. Grey-headed Flying-foxes are highly mobile animals, readily crossing extensive areas of artificial and highly modified habitat. The activities will not therefore impacts dispersal or movement patterns of the local population.
The proposed activities will therefore not significantly affect the roosting, breeding, foraging or movement patters of the species.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *vii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *viii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *x) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- *xi) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- *xii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

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EPBC Assessment – Grey Headed Flying Fox

Under the EPBC, an action is considered to have a significant impact on a Vulnerable species if "there is a real chance or possibility that it will:

- Lead to a long-term degrease in the size of an important population of a species;
- Reduce the area of occupancy of an important population;
- Fragment an existing important population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of an important population;
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere substantially with the recovery of the species."

Where an important population is "a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/ or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

While Grey-headed Flying-fox populations are not listed in any recovery plans or near the limit of the species range, they are likely to contribute to local and regional Grey-headed Flying-fox breeding and/or dispersal. Furthermore, they are likely to contribute to the local and regional genetic diversity including facilitating genetic flow along the east coast. Local populations should therefore be seen as important.

The proposed activities will result in the removal of a small number (probably <10) of large *Banksia integrifolia*'s which contributes to local Grey-headed Flying-fox foraging resources. In the context of surrounding resources, which are abundant, the loss of these resources will not detrimentally affect or reduce the local population. No activity associated with this project is planned for areas near local Grey-headed Flying-fox camps. Proposed activities will not therefore decrease the size of the local population, reduce its area of occupancy, fragment the population, adversely affect critical habitat or significantly reduce the extent of suitable habitat. Furthermore, the Grey-headed Flying-fox is highly mobile and able to cover large distances of artificial habitat including urban landscapes. The loss of a few individual trees and the construction of the substation will not affect their dispersal or traditional movement patterns. Nor is the proposed activities likely to result in an increase in any pest species or diseases that are known to lead to the species decline.

Consequently, the activities associated with this project are not likely to lead to a significant impact as outlined in the EPBC criteria.

COMMON BLOSSOM BAT *SYCONYCTERIS AUSTRALIS*

Background

Status: Vulnerable (Threatened Species Conservation Act 1995)

Ecology and Habitat: The Eastern Blossom Bat is Australia's smallest flying-fox, growing to around 40-60mm body length. As its common name may suggest, the species typically feeds on nectar and blossom. Hence they are regularly located foraging and feeding within coastal heathlands and forests where banksias are common. However the species has also been recorded taking quantities of fruit (Law and Lean 1999) and may therefore seasonally or occasionally utilise resources in rainforests.

Radio-tracking of the species has shown that individuals have a strong fidelity to feeding areas, which extend in size to around 13ha (Law 1993). The maximum distance any individual was recorded commuting from a roost to a foraging location was 4km, although the average distance moved was 0.8km in winter and 1.4km in summer (Law 1993).

Eastern Blossom Bats roost singularly within the subcanopy of the rainforest. Multiple roost locations are used throughout the individual's home range and each roost is rarely used more than one night in succession (Law 1993)

Distribution: The Common Blossom Bat is restricted to coastal areas and adjacent ranges from approximately Kempsey, NSW to the tip of Cape York Peninsula, QLD.

Threats: Recognised threats for the species include the clearing of coastal habitat for urban development or sandmining and the invasion of weed species, such as Bitou Bush, which suppress the regeneration of key food trees such as Banksia's.

Assessment of Significance

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Common Blossom Bats roost singularly within rainforest patches. However, most roosts occur in sizable patches that provide a core habitat away from edge effects. Suitable roost habitat for this species occurs within the two gullies to the east of site 1 and west of site 12. However these are minor in extent. By contrast, an extensive patch of rainforest occurs nearby at Skinners Shoot. It is likely that any local Common Blossom Bats will use this area for roosting in preference to habitats within the study area.
Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. This may results in the loss of individual *Banksia integrifolia* that may be used as a foraging resource by the Common Blossom Bats. However, this plant is common both in surrounding vegetation and within the local area. The loss of one or two trees is not considered likely to impact the local population or reduce the holding capacity of the local area.
Some trimming of emergent vegetation may also be required to ensure clear passage of the powerline easement over existing vegetation in gullies. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (eg, Camphor Laurel and/or Slash Pine). This will reduce the necessity for canopy trimming. Emergent *B. integrifolia* are scattered within this community and the resultant trimming is likely to affect only a small number of trees. In the context of surrounding foraging resources, this loss is not likely to affect any potential local Common Blossom bat populations.
Common Blossom Bats are mobile animals, readily crossing areas of artificial and highly modified habitat (Van Dyck and Strahan 2008). The activities will not therefore impacts dispersal or movement patterns of the local population.
The proposed activities will therefore not significantly affect the roosting, breeding, foraging or movement patters of the species.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *ix) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *x) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *xiii) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- *xiv) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

xv) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

References

Law, B. S. (1993). Roosting and foraging ecology of the Queensland blossom-bat (*Syconycteris australis*) in north-eastern New South Wales: Flexibility in response to seasonal variation. Wildlife Research 20: 419-431.

Law, B. S. and Lean, M. (1999). Common Blossom Bats (*Syconycteris australis*) as pollinators in fragmented Australian tropical rainforest. Biological Conservation 91: 201-212.

Van Dyck, S. and Strahan, R. (2008) The Mammals of the Australia. Reed New Holland, Sydney.

LITTLE BENTWING BAT *MINIOPTERUS AUSTRALIS*

Background
Status: Vulnerable (Threatened Species Conservation Act 1995)

Ecology and Habitat: Little Bentwing Bats roost in a range of structures including caves, tunnels, buildings and similar structures where they can gather in groups while hanging from the ceiling (Dwyer 1968, Van Dyck and Strahan 2006). They have on rare occasions been recorded roosting in tree hollows (Schultz 1997).
Foraging occurs by aerial pursuit with insects taken beneath the canopy on the wing, or around the edges of the canopy. They may be found in a wide variety of habitats including dry eucalypt forests, rainforests and paperbark swamps.

Distribution and Breeding: Little Bentwing Bats may be found north from around Newcastle in NSW to the tip of Cape York Peninsula (Menkhorst and Knight 2004). The species generally becomes more coastal in the south of its range (Van Dyck and Strahan 2006).
Mating takes place around in September and females give birth around December. Birth is given at designated maternity caves, where Little Bentwing Bats may aggregate in extremely large numbers. These maternity caves are often shared with Common Bentwing Bats *Miniopterus schreibersii*, particularly in the south.
Threats: Perhaps the greatest threat to the species is disturbance or loss of maternity roosts. However destruction of non-maternity caves and roosting sites may also impact the species.

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No Maternity caves occur within or adjacent to the study area. No impacts on the species breeding cycle is therefore anticipated. Some potential structures suitable for non-maternity roosting occurs in culverts beneath the existing rail corridor. However inspection of these failed to locate any bats. These structures were quite damp and it is unlikely that they would be used by the species during any period of the year.
Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. Some trimming of emergent vegetation may be required to ensure clear passage of the powerline easement over existing vegetation in gullies. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (eg, Camphor Laurel and/or Slash Pine). Consequently, it is unlikely that any significant areas of potential foraging habitat for Little Bentwing Bats will be lost as a result of the project.
Little Bentwing Bats are mobile animals, readily crossing through mosaic landscapes. The activities will not therefore impacts dispersal or movement patterns of the local population.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *xi) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *xii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

- *xvi) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

xvii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

xviii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.
Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.
Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

References

Dwyer, P. D. (1968). The biology, origin, and adaptation of *Miniopterus australis* in New South Wales. Australian Journal of Zoology 16: 49-68.

Menkhorst, PW and Knight, F (2004). A field guide to the mammals of Australia. Oxford University Press, Melbourne.

Schulz, M. (1997). The Little Bent-wing Bat *Miniopterus australis* roosting in a tree hollow. Australian Zoologist, 30(3): 329.
Van Dyck, S. and Strahan, R. (2008) The Mammals of the Australia. Reed New Holland, Sydney.

COMMON BENTWING BAT *MINIOPTERUS SCHREIBERSII OCEANENSIS*

Background
Status: Vulnerable (Threatened Species Conservation Act 1995)

Ecology and Habitat: Common Bentwing Bats roost in a variety of structures including caves, tunnels, buildings and similar structures. Selection of roosts seems to depend somewhat on seasonal conditions as, during the cooler months when insect numbers are low, bats often select cool areas within caves, mines,

tunnels and drains. These structures may have temperatures as low as 10°C allowing the animals to go into torpor, thereby reducing energy expenditure (Van Dyck and Strahan 2006).
Unlike Little Bentwing Bats, Common Bentwing Bats have longer, narrower wings and tend to forage above the canopy or along its edges. They forage directly on the wing, consuming predominantly moths and may regularly forage around streetlights (Van Dyck and Strahan 2006).
Distribution and Breeding: Common Bentwing Bats may be found along the coast and ranges from near Warrnambool in Victoria to the tip of Cape York Peninsula (Menkhorst and Knight 2004).
Bats reach sexual maternity at the age of two and females give birth to a single young from late October to early January. Similar to Little Bentwing Bats, Common Bentwing Bats only give birth at traditional maternity caves and may co-inhabit.
Threats: Perhaps the greatest threat to the species is disturbance or loss of maternity roosts. However destruction of non-maternity caves and roosting sites may also impact the species.

Assessment of Significance
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No Maternity caves occur within or adjacent to the study area. No impacts on the species breeding cycle are therefore anticipated. Some potential structures suitable for non-maternity roosting occur in culverts beneath the existing rail corridor. However inspection of these failed to locate any bats. These structures were quite damp and it is unlikely that they would be used by the species during any period of the year.
Vegetation clearance is not required for the construction of the substation at site 7 or site 12. These areas are already void of native vegetation. However, the powerline easement required to connect the substation at site 12 will, by necessity, pass over existing vegetation. Some trimming of emergent vegetation may be required to ensure clear passage of the powerline easement over existing vegetation in gullies. Careful placement of the powerline will allow it to pass over existing canopy gaps or areas of canopy infested by exotic species (eg, Camphor Laurel and/or Slash Pine). Consequently, it is unlikely that any significant areas of potential foraging habitat for Common Bentwing Bats will be lost as a result of the project.
Common Bentwing Bats are mobile animals, readily crossing through mosaic landscapes. The activities will not therefore impacts dispersal or movement patterns of the local population.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable. No endangered populations as listed in Part 2 of Schedule 1 of the TSC Act are present within or adjacent to the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *xiii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- *xiv) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable. No endangered ecological communities as defined under Part 3 of Schedule 1 of the TSC Act or critically endangered communities as defined under Part 2 of Schedule 1A of the TSC Act occur within or adjacent to the study area.

d) in relation to the habitat of a threatened species, population or ecological community:

xix) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

xx) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

xxi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

No vegetation clearance is required for the construction of a power substation at either site 7 or 12. These areas are already void of vegetation.

Little vegetation clearance will be required for the construction of an above ground powerline easement if site 12 is selected. However, the powerline will be required to traverse two small patches of vegetation associated with the gully line to the east of site 7 (less than 0.5ha in size) and to the west of site 12 (less than 1.5ha in size). To ensure clear passage and safe operation, trimming of some emergent tree clearing may be required when spanning over the vegetated gullies. Careful positioning of the powerline easement will allow it to pass through existing canopy gaps or pass over exotic canopy species such as Camphor Laurel and Slash Pine.

Activities will therefore not result in loss of habitat or further fragmentation. Furthermore, modification of the habitat will be minor and not significantly affect the long-term survival of the species. These areas of habitat are minor in the context of surrounding vegetation and not considered important for the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No applicable. No areas of Critical Habitat occur within or adjacent to the study area.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Not applicable. No recovery plan or threat abatement plan has been developed for this species.

References

Menkhorst, PW and Knight, F (2004). A field guide to the mammals of Australia. Oxford University Press, Melbourne.

Van Dyck, S. and Strahan, R. (2008) The Mammals of the Australia. Reed New Holland, Sydney.

Appendix H

Threatened Species not considered likely

Threatened Species not Considered Likely to Occur

Special Status abbreviations are as follows:
Threatened Species Conservation Act 1995 (TSC), E1 = Endangered, V = Vulnerable.
Federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC): E = endangered, V = vulnerable, M = Migratory species.

Zoological Name	Common Name	TSC	EPBC	Comments
Amphibians				
Litoria aurea	Green and Golden Bell Frog	E1	V	Inhabits ponds and waterbodies. No suitable habitat present
Litoria olongburensis	Wallum Treefrog	V	V	Inhabits creeks, lakes and other waterbodies with acidic waters. No suitable habitat present
Crinia tinnula	Wallum Froglet	V		Inhabits creeks, akes, swamps, bogs and other waterbodies with acidic waters. No suitable habitat present
REPTILES				
Caretta Caretta	Loggerhead Turtle	E1	E	Oceanic species. No suitable habitat present.
Dermochelys coriacea	Leathery Turtle,	V	V	
Chelonia mydas	Green Turtle	V	V	Oceanic species. No suitable habitat present.
BIRDS				
Macronectes giganteus	Southern Giant Petrel	E1	E	Pelagic species. No suitable habitat present.
Macronectes halli	Northern Giant Petrel	V	V	Pelagic species. No suitable habitat present.
Thalassarche impavida	Campbell Albatross		V	
Pterodroma leucoptera leucoptera	Gould's Petrel	E1		Pelagic species. No suitable habitat present.
Pterodroma neglecta neglecta	Kermadic Petrel	V	V	Pelagic species. No suitable habitat present.

Zoological Name	Common Name	TSC	EPBC	Comments
Lophoictinia isura	Square-tailed Kite	V		Open forests and woodlands. Most often associated with large areas of contiguous habitat. Habitat within the study area is highly fragmented and much more mesic in nature than typical Square-tailed Kite habitats.
Pandion haliaetus	Osprey	V		Inhabits Beaches, coastal lakes and estuaries. No suitable habitat present.
Botaurus poiciloptilus	Australian Bittern	V		Occurs within wetlands, dams and Lakes with abundant aquatic vegetation. No suitable habitat present.
Ixobrychus flavicollis	Black Bittern	V		Occurs within wetlands and waterways, particularly heavily vegetated rivers. No suitable habitat present.
Rostratula australis[1]	Australian Painted Snipe	E1	V	Occurs within wetlands, dams and Lakes with abundant aquatic vegetation. No suitable habitat present.
Amaurornis olivaceus	Bush-hen	V		Inhabits thick dense vegetation associated with low-lying areas and creeklines. No suitable habitat present.
Haematopus longirostris	Pied Oystercatcher	V		Found along beachfronts, within estuaries and rocky headlands. No suitable habitat present
Haematopus fuliginosus	Sooty Oystercatcher	V		Inhabits similar areas to Pied Oystercatchers but is generally more often observed in rocky areas and rarely open beachfronts. No suitable habitat present.
Grus rubicunda	Brolga	V		Wetlands, waterways and occasionally open padocks with thick grasses. Habitats within study area not typical for this species and it is therefore unlikely to occur.
Esacus neglectus	Beach Stone-curlew	E1		Inhabits beachfronts and estuaries. No suitable habitat present.
Ephippiorhynchus asiaticus	Black-necked Stork	E1		Occurs in swamps, wetlands, river systems, estuaries and dams. No suitable habitat present.
Irediparra gallinacea	Comb-crested Jacana	V		Found on dams and waterways with abundant floating aquatic vegetation. No suitable habitat present.

[1] Listed under *Rostratula bengalensis*.

Zoological Name	Common Name	TSC	EPBC	Comments
Calidris tenuirostris	Great Knot	V		Forages for invertebrates along beaches, lakes, waterways and mudflats. No suitable habitat present.
Gygis alba	White Tern	V		An oceanic and beachfront species including off-shore islands. No suitable habitat present.
Procelsterna cerulea	Grey Ternlet	V		An oceanic and beachfront species including off-shore islands. No suitable habitat present.
Sterna albifrons	Little Tern	E1		Found foraging along beachfronts, estuaries and coastal lakes. Nests on sand-dunes around river mouths. No suitable habitat present.
Sterna fuscata	Sooty Tern	V		An oceanic and beachfront species including off-shore islands. No suitable habitat present.
Ptilinopus magnificus	Woompoo Fruit-dove	V		Found in rainforests and wet schlerophyll forests with abundant fruiting bodies. Usually restricted to larger remnant areas. Habitats within the study area are highly fragmented and hence it is considered that the species is unlikely to occur despite the presence of fruiting plant species.
Ptilinopus regina	Rose-crowned Fruit-dove	V		Found in rainforests and wet schlerophyll forests with abundant fruiting bodies. Usually restricted to larger remnant areas. Habitats within the study area are highly fragmented and hence it is considered that the species is unlikely to occur despite the presence of fruiting plant species.
Ptilinopus superbus	Superb Fruit-dove	V		Found in rainforests and wet schlerophyll forests with abundant fruiting bodies. Usually restricted to larger remnant areas. Habitats within the study area are highly fragmented and hence it is considered that the species is unlikely to occur despite the presence of fruiting plant species. Furthermore the species is rarely recorded within the local area.
Calyptorhynchus lathami	Glossy Black Cockatoo	V		Feeds almost exclusively on *Allocasuarina* seeds and nests in large hollow-bearing trees. No suitable foraging or nesting resources present within study area.

Zoological Name	Common Name	TSC	EPBC	Comments
Lathamus discolor	Swift Parrot	E1	E	
Cyclopsitta diophthalma coxeni	Coxen's Fig-parrot	E1	E, M	Critically endangered species which is highly unlikely to occur in the study area. The species favours rainforest and coastal scrub habitats. While some fruiting plants suitable for the species is present, its scarcity suggests it is unlikely to occur.
Podargus ocellatus	Marbled Frogmouth	V		Inhabits larger patches of rainforest and wet sclerophyll gullies, particularly those with abundant vines and palms. No suitable habitat present.
Tyto capensis	Grass Owl	V		Inhabits thick grasslands and sedgelands. Occasionally found in low range heathland. No suitable habitat present.
Tyto novaehollandiae	Masked Owl	V		Inhabits dry open eucalypt forests and adjacent wet sclerophyll forests. Nests in large hollow-bearing trees. Highly fragmented habitats unlikely to support any resident birds and hence it is therefore unlikely to occur.
Tyto tenebricosa	Sooty Owl	V		Inhabits rainforests and wet sclerophyll gullies with large hollow-bearing trees. Highly fragmented habitats unlikely to support any resident birds and hence it is therefore unlikely to occur.
Xanthomyza phrygia	Regent Honeyeater	E1	E	Box and Ironbark woodlands with abundant flowering eucalypts. No suitable habitat present.
Poephila cincta cincta	Black-throated Finch	E1	E	Inhabits grassy woodlands with abundant native grasses. No suitable habitat present.
Stagonopleura guttata	Diamond Firetail	V		Inhabits grassy woodlands with abundant native grasses. No suitable habitat present.
MAMMALS				
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	No confirmed local records. Typically only located in very large tracts of remnant forests where pressures from introduced predators are less.

Zoological Name	Common Name	TSC	EPBC	Comments
Planigale maculata	Common Planigale	V		Occurs in a variety of habitats, particularly dry forests with complex ground diversity providing abundant insects and refugia. No suitable habitat present.
Phascolarctos cinereus	Koala	V		Known to forage on particular Eucalypt species. No eucalypts present within study area.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Species is generally occurs in large tracts of vegetation with a dense understorey including wet sclerophyll forests, dry sclerophyll and heathlands. No suitable habitat present.
Chalinolobus dwyeri	Large Pied Bat	V	V	Predominantly inhabits rainforests, wet sclerophyll forest. Habitats within study area highly fragmented and therefore unlike to be suitable. No confirmed records of the species within the local area.
Myotis adversus	Large-footed Myotis	V		Inhabits a variety of habitat types, but forages over open water. No suitable habitat present.
Nyctophilus bifax	Eastern Long-eared Bat	V		Inhabits rainforests and wet sclerophyll forests. Highly fragmented habitats within study area not considered likely to support resident animals or encourage foraging.
Scoteanax rueppellii		V		Occurs in a variety of habitat types but requires hollow-bearing trees for roosting. While transient individuals may occasionally occur, this is generally considered to be unlikely due to the highly fragmented nature of existent habitats.
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V		Native woodlands and forests with good ground cover complexity including native grasses and sedges. No suitable habitat present.
Arctocephalus pusillus doriferus	Australian Fur Seal	V		A coastal species. No suitable species present.
Dugong dugon	Dugong	E1		Bays, estuaries and calm coastal waters with sea-grass beds. No suitable habitat present.
Eubalaena australis	Southern Right Whale	V	V	An oceanic species. No suitable habitat present.
Megaptera novaeangliae	Humpback Whale	V	V	An oceanic species. No suitable habitat present.

Appendix I

Observed terrestrial fauna

Appendix I. Observed Terrestrial Vertebrates

Special Status abbreviations are as follows:

New South Wales *Threatened Species Conservation Act 1995* (TSCA Status): E = Endangered species; **V** = Vulnerable Species

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Status): E = Endangered species; **V** = Vulnerable Species; **M** = Migratory Species

GROUP		**Status**	
Scientific Name	**Common Name**	**TSC**	**EPBC**
AMPHIBIANS			
Bufo marinus	Cane Toad		
Crinia signifera	Common Eastern Froglet		
Limnodynastes peronii	Brown-striped Frog		
REPTILES			
Lampropholis delicata	Dark-flecked Garden Sunskink		
BIRDS			
Acanthiza pusilla	Brown Thornbill		
Acanthorhynchus tenuirostris	Eastern Spinebill		
Alectura lathami	Australian Brush Turkey		
Anthochaera chrysoptera	Little Wattlebird		
Anthus novaeseelandiae	Australian Pipit		
Ardea ibis	Cattle Egret		M
Cacomantis flabelliformis	Fan-tailed Cuckoo		
Colluricincla megarhyncha	Little Shrike-thrush		
Columba leucomela	White-headed Pigeon		
Cracticus nigrogularis	Pied Butcherbird		
Eopsaltria australis	Eastern Yellow Robin		
Geopelia humeralis	Bar-shouldered Dove		
Gerygone olivacea	White-throated Gerygone		
Gymnorhina tibicen	Australian Magpie		
Hirundo ariel	Fairy Matin		
Hirundo neoxena	Welcome Swallow		
Lalage leucomela	Varied Triller		
Lichmera indistincta	Brown Honeyeater		
Malurus cyaneus	Superb Fairy-wren		
Malurus melanocephalus	Red-backed Fairy-wren		
Meliphaga lewinii	Lewin's Honeyeater		
Merops ornatus	Rainbow Bee-eater		M
Microeca leucophaea	Jacky Winter		
Myzomela sanguinolenta	Scarlet Honeyeater		
Neochmia temporalis	Red-browed Finch		
Pachycephala pectoralis	Golden Whistler		
Phylidonyris nigra	White-cheeked Honeyeater		
Psophodes olivaceus	Eastern Whipbird		
Rhipidura fuliginosa	Grey Fantail		
Rhipidura leucophrys	Willy Wagtail		
Sericornis frontalis	White-browed Scubwren		
Sphecotheres viridis	Figbird		

Strepera graculina	Pied Currawong		
Taeniopygia bichenovii	Double-barred Finch		
Threskiornis molucca	Australian White Ibis		
Zosterops lateralis	Silvereye		
MAMMALS			
Miniopterus australis	Little Bentwing Bat	V	
Miniopterus schreibersii	Common Bentwing Bat	V	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Rattus sp			
Wallabia bicolor	Swamp Wallaby		

Appendix J

Dial Before You Dig/Infrastructure Location Maps

Plant Location Details

Telstra Corporation Limited
ACN 051 775 556, ABN 33 051 775 556

To:	**Paul Flint**	From:	**Telstra, Network Integrity**
Company:	**Not Supplied**	Sequence No:	**13074405**
Address:	**Suite 5 60 Nerang St Nerang Qld, 4211**	Date:	
		District:	**NR**
Phone:	**0755969621**	Fax Number:	**0755784295**
		NIAC Alert:	
		NIAC Priority:	**No hazard identified**
Email:	**paul.flint@mwhglobal.com**		

The following sketch/plan(s) is/are provided from Telstra's records in response to your request to show the approximate location of Telstra's installations within the vicinity of:

Location:	**Lot 4 DP264161 Suffolk Park NSW, 2481**
Side of Street:	**SW**
Intersection:	**Old Bangalow RD**

IMPORTANT:

- Please read and understand all the information and disclaimers provided below.
- Sketches and Plans provided by Telstra are circuit diagrams only and indicate the presence of telecommunications plant in the general vicinity of the geographical area shown; exact ground cover and alignments cannot be given with any certainty and cover may alter over time. Telecommunications plant seldom follow straight lines and careful on site investigation is essential to uncover and reveal its exact position.
- Due to the nature of Telstra plant and the age of some cables and records, it is impossible to ascertain the location of all Telstra plant. The accuracy and/or completeness of the information can not be guaranteed and, accordingly Telstra plans are intended to be indicative only.

"DUTY OF CARE"

When working in the vicinity of telecommunications plant you have a legal "Duty of Care" that must be observed. The following points must be considered:-

1. It is the responsibility of the owner and any consultant engaged by the owner, including an architect, consulting engineer, developer, and head contractor to design for minimal impact and protection of Telstra plant. Telstra will provide free plans and sketches showing the presence of its network to assist at this design stage.
2. It is the owner's (or constructor's) responsibility to:-

a) Request plans of Telstra plant for a particular location at a reasonable time before construction begins.

b) Visually locate Telstra plant by hand digging (pot-holing) where construction activities may damage or interfere with Telstra plant (see "Essential Precautions and Approach Distances" section for more information).

c) Contact Telstra's **Network Integrity Group** (see below for details) if Telstra plant is wholly or partly located near planned construction activities.

DAMAGE:

ANY DAMAGE TO TELSTRA'S NETWORK MUST BE REPORTED TO 132203 IMMEDIATELY.

- The owner is responsible for all plant damage when works commence prior to obtaining Telstra plans, or failure to follow agreed instructions.
- Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

CONCERNING TELSTRA PLANS:

- **Phone 1100 - Dial Before You Dig** for free plans of Telstra plant locations. Please give at least 2 business days notice.
- Telstra plans and information provided are **valid for 60 days** from the date of issue.
- Telstra retains copyright in all plans and details provided in conjunction with your request. These plans and or details should be disposed of by shredding or any other secure disposal method after use.
- Telstra plans or other details are provided for the use of the applicant, its servants, or agents, and shall not be used for any unauthorised purpose.
- Please contact the **Network Integrity Help Desk** (see below for details) immediately should you locate Telstra assets not indicated on these plans.

- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
    - Please ensure Telstra plans and information provided remains on-site at all times throughout your construction phase.

ESSENTIAL PRECAUTIONS and APPROACH DISTANCES:

NOTE: If the following clearances cannot be maintained, please contact the Network Integrity Help Desk (see below for details) for adice on how best to resolve this situation.

1. On receipt of plans and sketches and before commencing excavation work or similar activities near Telstra's plant, **carefully locate this plant first** to avoid damage. Undertake prior manual exposure such as potholing when intending to excavate or work **closer** to Telstra plant than the following approach distances.

- Where Telstra's plant is in an area where road and footpaths are well defined by kerbs or other features a minimum clear distance of 600mm must be maintained from where it could be reasonably presumed that plant would reside.
- In non established or unformed reserves and terrain, this approach distance must be at least 1.5 metres.
- In country/rural areas which may have wider variations in reasonably presumed plant presence, the following minimum approach distances apply:

a) Parallel to major plant: 10 metres (for IEN, optic fibre and copper cable over 300 pairs)

b) Parallel to other plant: 5 metres

Note: Even manual pot-holing needs to be undertaken with extreme care, commonsense and employing techniques least likely to damage cables. For example, orientate shovel blades and trowels parallel to the cable rather than digging across the cable.

- If construction work is parallel to Telstra plant, then careful hand digging (pot-holing) at least every 5m is required to establish the location of all plant, hence confirming nominal locations before work can commence.

2. Maintain the following minimum clearance between construction activity and **actual location** of Telstra Plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of Telstra ducts.* *300mm compact clearance cover before compactor can be used across Telstra ducts.*
Boring Equipment **(in-line, horizontal and vertical)**	*Not within 2.0m of **actual location**.* *Constructor to hand dig (pot-hole) and expose plant.*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Telstra ducts (or plant)* *with less than 600mm cover.* *Constructor to check depth via hand digging.*
Mechanical Excavators, Boring and Tree Removal	*Not within 1.0m of **actual location.*** *Constructor to hand dig (pot-hole) and expose plant.*

- All Telstra pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.
- All Telstra conduit should have the following minimum depth of cover after the completion of your work:-

Footway 450mm

Roadway 450mm at drain invert and 600mm at road centre crown

- For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact the Network Integrity Help Desk (see below for details).

FURTHER ASSISTANCE:

Over-the-phone assistance can be obtained by calling the **Network Integrity Help Desk** below.

Where on-site location is provided, the owner is responsible for all hand digging (pot-holing) to visually locate and expose Telstra plant.

If plant location plans or visual location of Telstra plant by digging reveals that the location of Telstra plan is situated wholly or partly where the owner plans to work, then **Telstra's Network Integrity Group** must be contacted through the **Network Integrity Help Desk** to discuss possible engineering solutions.

The contact numbers for the **Network Integrity Help Desk** are as follows:-

Phone: 1800 653 935 (7.30am to 5pm weekdays)
Fax: (02) 49613714 (24 hours per day 7 days a week)

NOTE:

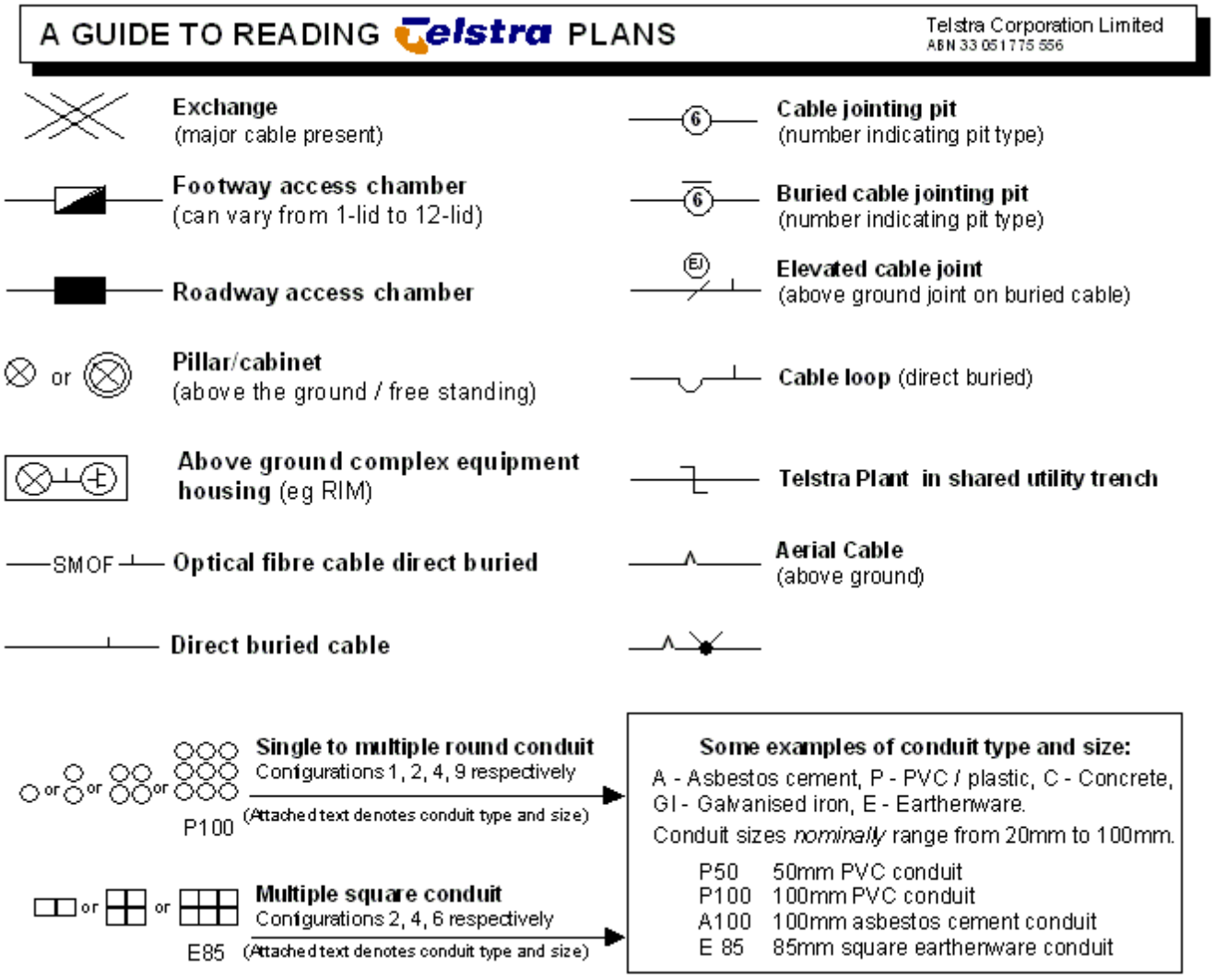
If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer or constructor. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works.

RURAL LANDOWNERS - IMPORTANT INFORMATION

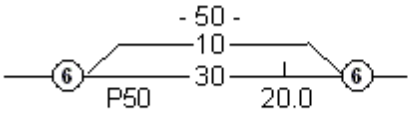
Where Telstra owned cable crosses agricultural land, Telstra will provide a one off free on-site electronic cable location. Please note that the exact location of cables can only be verified by visual proving by pot holing, which is not covered by this service. The Network Integrity Helpdesk Officer will provide assistance in determining whether a free on-site location is required. Please ring the Network Integrity Helpdesk Officer as listed above.

PRIVACY NOTE

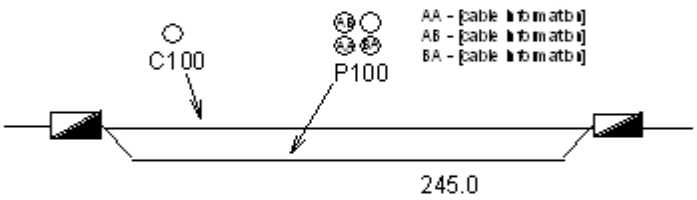
Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps you information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy



Some examples of how to read Telstra plans:



One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

WARNING: Telstra's plans show only the presence of cables and plant. They only show their position relative to road boundaries, property fences etc. at the time of installation and Telstra does not warrant or hold out that such plans are accurate thereafter due to changes that may occur over time.
DO NOT ASSUME DEPTH OR ALIGNMENT of cables or plant as these vary significantly.
The customer has a DUTY OF CARE when excavating near Telstra cables and plant. Before using machine excavators TELSTRA PLANT MUST FIRST BE PHYSICALLY EXPOSED BY SOFT DIG (potholing) to identify its location.
Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

ACCREDITED PLANT LOCATERS (For your area)

On-site assistance should be sought from an **Accredited Plant Locater** if the telecommunications plant cannot be located within 2.5 metres of the locations indicated on the drawings provided.

On-site advice should be obtained from a suitably qualified contractor highly skilled in locating Telstra plant if there is any doubt whatsoever about the actual location of the telecommunications plant, the best method for locating the telecommunications plant or the correct interpretation of the drawings provided. In the case where Telstra plant is outside a recognised road reserve Telstra recommends that the **Network Integrity Help Desk** is contacted for assistance prior to engaging an Accredited Plant Locater.

For the assistance of customers Telstra has established strict criteria to assess the skill of contractors that may be engaged by owners requiring Telstra plan locating services to perform any of the following activities if requested to do so by the owner:

- review Telstra's plans to assess the approximate location of Telstra plant;
- advise owners of the approximate location of Telstra plant according to the plans;
- advise owners of the best method for locating Telstra plant;
- advise owners of the hazards of unqualified persons attempting to find the exact location of Telstra plant and working in the vicinity of Telstra plant without first locating its exact position.
- perform trial hole explorations by hand digging (pot-holing) to expose Telstra plant with a high degree of skill, competence and efficiency and utilising all necessary safety equipment.

Telstra has provided a number of contractors with certification as an Accredited Plant Locater. **A list of Accredited Plant Locaters operating in your area is attached. Accredited Plant Locaters are certified by Telstra to perform the tasks listed above. Owners may engage Accredited Plant Locaters to perform these services, however Telstra does not give any warranty in relation to these services that Accredited Plant Locaters are competent or experienced to perform any other services.**

The following list provides the names and contact details for Accredited Plant Locaters who service your area and can provide you with assistance in locating Telstra plant on site. These organisations have been able to satisfy Telstra that they have a sound knowledge of telecommunications plant and its sensitivity to disturbance; appropriate equipment for locating telecommunications plant and competent personnel who are able to interpret telecommunications plans and sketches and understand safety issues relevant to working around telecommunications plant. They are also able to advise you on the actions which should be taken if the work you propose will/could result in a relocation of the telecommunications plant and/or its means of support.

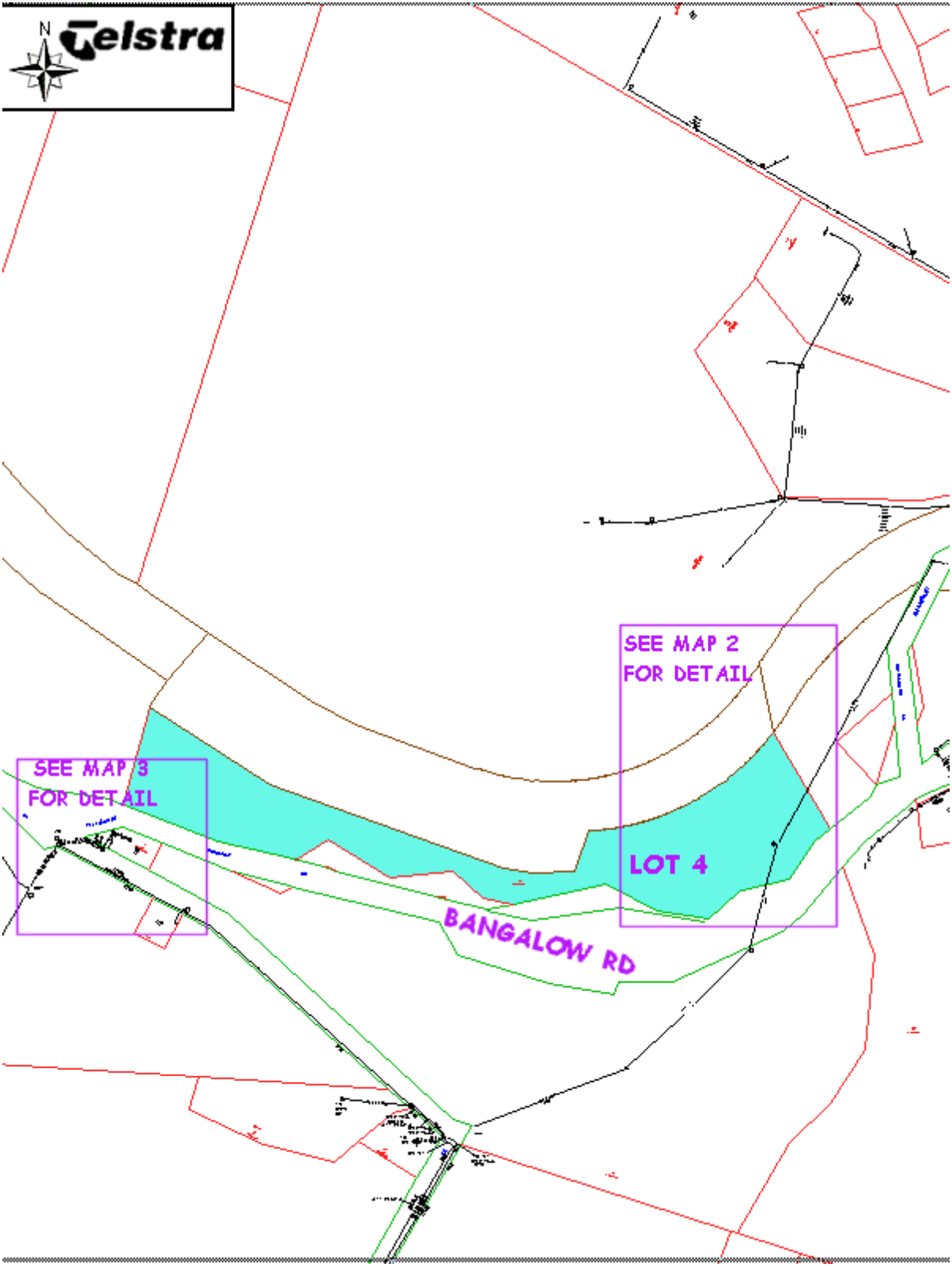
We recommend that you engage the assistance of one of these Accredited Plant Locaters as a step towards discharging your Duty of Care obligations when seeking the location of Telstra's telecommunications plant.

Please Note:

1. The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the organisation engaged. Telstra is not a party to any contract entered into between an owner and an Accredited Plant Locater. The Accredited Plant Locaters are able to provide guidance concerning the extent of site investigations required.
2. Payment for the site assistance will be your responsibility and payment details should be agreed before the engagement is confirmed.
3. Telstra does not accept any liability or responsibility for the performance of or advice given by an Accredited Plant Locater. Accreditation is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.
4. Each Accredited Plant Locater has been issued with a certificate which confirms the Accreditation. Each year Telstra will reassess the accreditation and where appropriate will issue a letter confirming the accreditation for the next calendar year. You have the right to request the organisation you engage to show evidence of this certificate and its currency.
5. The Accredited Plant Locater is required to service each engagement with the personal attendance of at least one accredited employee who has satisfactorily completed a Telstra approved employee accreditation training course. These people will carry a certification card issued by Telstra.
6. Neither the Accredited Plant Locater nor any of its employees are an employee or agent for Telstra and Telstra is not liable for any damage or loss caused by the Accredited Plant Locater or its employees.
7. This list contains the current names and contact details of Accredited Plant Locators who service your area, however, these details are subject to change.

Accredited Plant Locaters - NR district:

Name and Address	Phone Number	Ask for:
BOWDEN EARTHMOVING	0266 771363 or 0427 66771363	Roger Bowden
Brisbane & Coast Cable Location. PO Box843, Paradise Point. QLD 4216	Ph: 07 55773520, Fax07 55774105 Mob 0407 138 760 Mob 0418 731 191	 Greg Nunn Wayne Finch
CABLE & PIPE LOCATIONS - Coffs Harbour, Yamba, Port Macquarie, Dorrigo	02 66491234 or 0408 730 430	Shane Buckley
COOMBA EARTHMOVING - FORSTER	02 6554 2297	Darryl Jennings
DR & JE STANFORD - Mullumbimby	0418 663 324 or 02 66847017	Dean Stanford
EAST COAST CABLE & PIPE LOCATIONS - LOCATIONS FOR OCEAN SHORES, GRAFTON & TENTERFIELD	02 66803234 or 0414859830	Greg HILL
HOW DEEP WATER LEAKERS, PIPE & CABLE LOCATION SERVICE - Gold Coast	Ph 0412 214810, A/H 07 55946910	Lex Fingleton
I.R &M Johnson Pty Ltd - Mudgeeraba. Area covered: Northern NSW & South East QLD	Ph: 0755305773 Mob: 0427 305 773	Ian Johnson
LAMBERT LOCATIONS - Gold Coast QLD	Ph 0755 960248Mob: 0418 150035	Ian Lambert
LUDWIG'S TRUCK & TRENCHING - Tabulam	Ph & Fax 02 66661484 Mob: 0428 555 587	Carl Ludwig
J & R Cabler// Installer	Ph: 02 6632 1540 Fax: 02 6632 2870 Mob: 0427 321 540	John O'Reilly
JOHNS CABLE LOCATIONS - ALSTONVILLE	02 66244144 or 0415 458152	Terry Rice
MIDCOAST UNDER-ROAD BORING- STROUD	02 4994 5211	Wanda Russell
MURRAY's EARTHMOVING - TAMWORTH	02 6765 3266 0427 166 486	Col Murray Shane Murray
NETWORK PROTECTION SPECIALISTS - Tweed Heads	07 55367878 or 0418 257 527	Dean Tosh
NEVILLE FRANKLIN ELECTRICAL - Locations for Coffs Harbour,Grafton, Macksville, Nambucca Heads, Dorrigo	02 66536693 or 0418 660 823	Nev Franklin
NORTH WEST CIVIL - Tamworth	02 67628911 0438914875	Rob Terry
NORTHERN RIVERS TRENCHING SERVICE - Lismore, Ballina -Tweed Heads	02 66847200 or 0414847200	Neil Parrington
ON-SITE COMMUNICATIONS - Gold Coast, Tweed Heads, Northern Rivers	07 55226800 or 0409727134	Steve Perry
PB CIVIL - North Lismore	02 66217171 or 0412 753 002	Andrew Purtle
RUTHERFORD ELECTRICAL ENGINEERING - RUTHERFORD	02 4932 7344	Office staff
SEEK LOCATIONS PTY LTD - Taree, Forster, Port Macquaire.	02 65 591 617 02 65 558 550 or 0407 256 858	Brian Hanson Brad Rae
TRICON PLUMBING - Browns Plains.Qld	07 38001934 or 0412 593 756	Alan Pullin



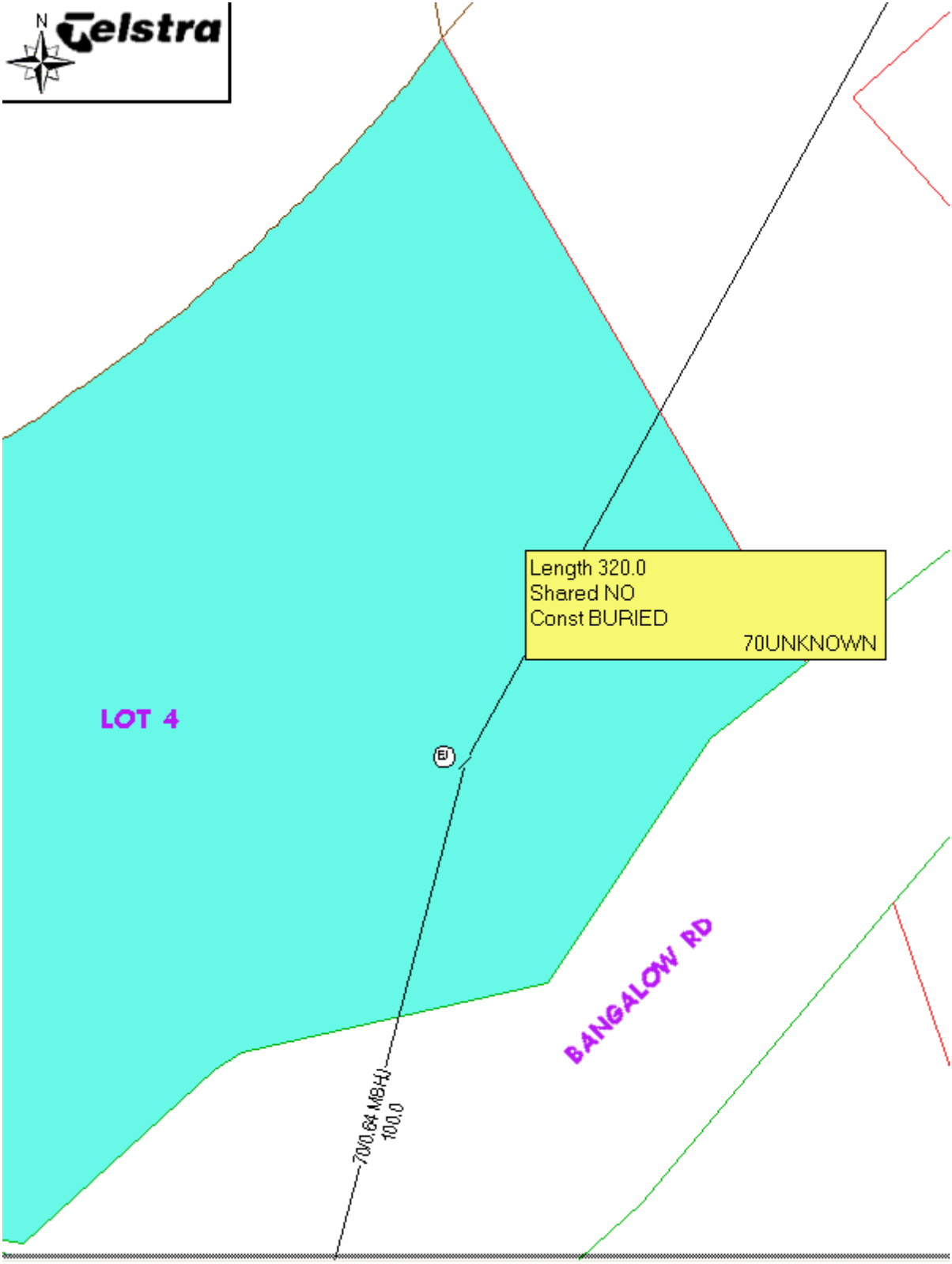
Sequence Number: 13074405; Map Number: LOCAL CABLE OVERVIEW MAP 1 OF 3; Map Reference: BYBY 19; Comment: KC 16/1/08

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the exact location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information provided can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information provided in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information provided are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.



Sequence Number: 13074405; Map Number: LOCAL CABLE DETAIL MAP 2 OF 3 ; Map Reference: BYBY 19; Comment: KC 16/1/08

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the exact location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information provided can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

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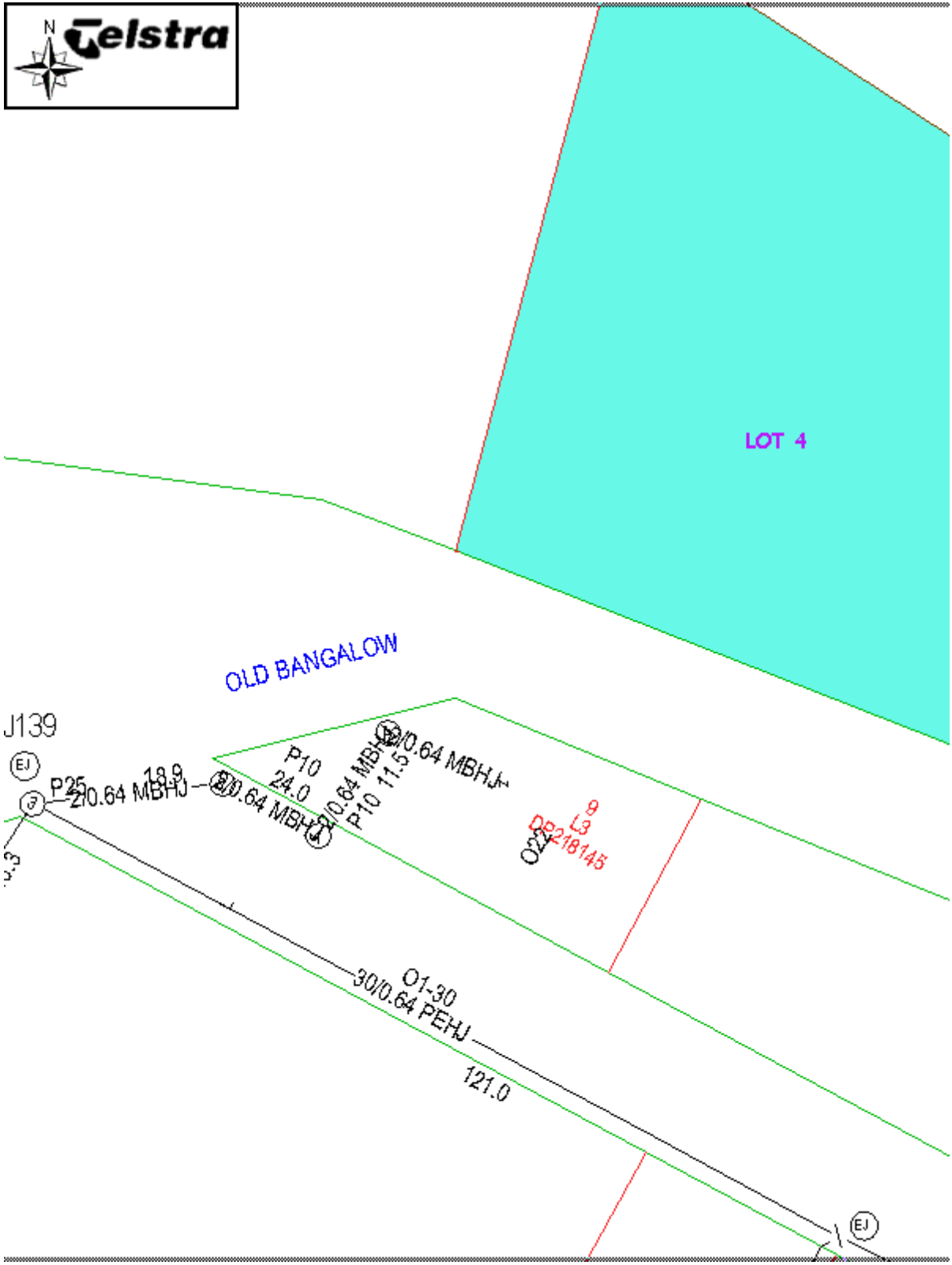
Telstra plans and information provided are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.



Sequence Number: 13074405; Map Number: LOCAL CABLE DETAIL MAP 3 OF 3 ; Map Reference: BYBY 19; Comment: KC 16/1/08

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the exact location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information provided can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

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Please read and understand the information provided in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

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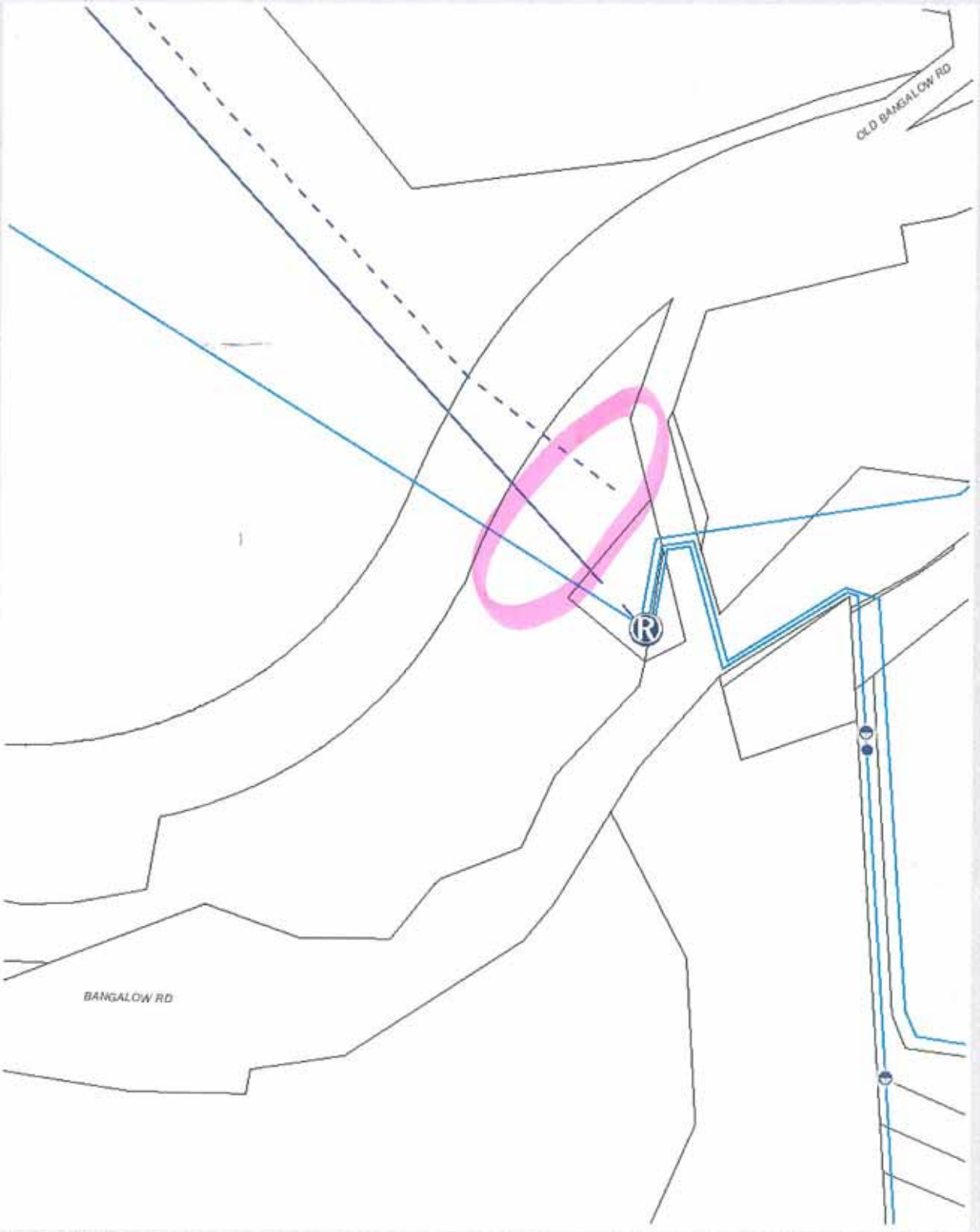

Disclaimer : While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no warranty is given that the information contained on this map is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of the information prior to using it.
Note : The information shown on this map is a copyright of the Byron Shire Council and the NSW Department of Lands.

Scale = 1:2,884

Metres 50 100 150

(Scale correct at A4 size)

4/03/2008