

# Memorandum

To	<b>Andrew Stannard</b>	From	<b>Jane Stark C/o Aurecon</b>
Copy		Reference	<b>225678</b>
Date	<b>11 October 2012</b>	Pages (including this page)	<b>32</b>
Subject	<b>Fairview Ecological Assessment Report</b>		

Mr Stannard

This memorandum documents the results of an ecological investigation of the proposed development area located on Lot 6 on CP908635, as shown on Figure 1.1.

The proposed development area was assessed by two Aurecon ecologists (Hayley Poole and Sandra Walters) on 19 and 20 September 2012.

Reports specific to other proposed development areas on Lot 6 on CP908635 have been previously prepared and submitted to Santos:

- Ecological Assessment Report – Water to Grade Pipeline Corridor Investigations Lot 6 CP908635; Document Reference 0020-GLNG-4-1.3-0024
- Fairview Ecological Assessment Report – Lot 6 on CP908635 Post Site-Scout Realignment Report; Document Reference 0020-GLNG-4-1.3-0024-01

This memorandum should be treated as an addendum to the reports listed above. This memorandum is specific to the ecology of the proposed development areas illustrated in Figure 1.1. These areas have been labelled as Areas A to F for ease of reference.

## 1 Ecological assessment of Area A

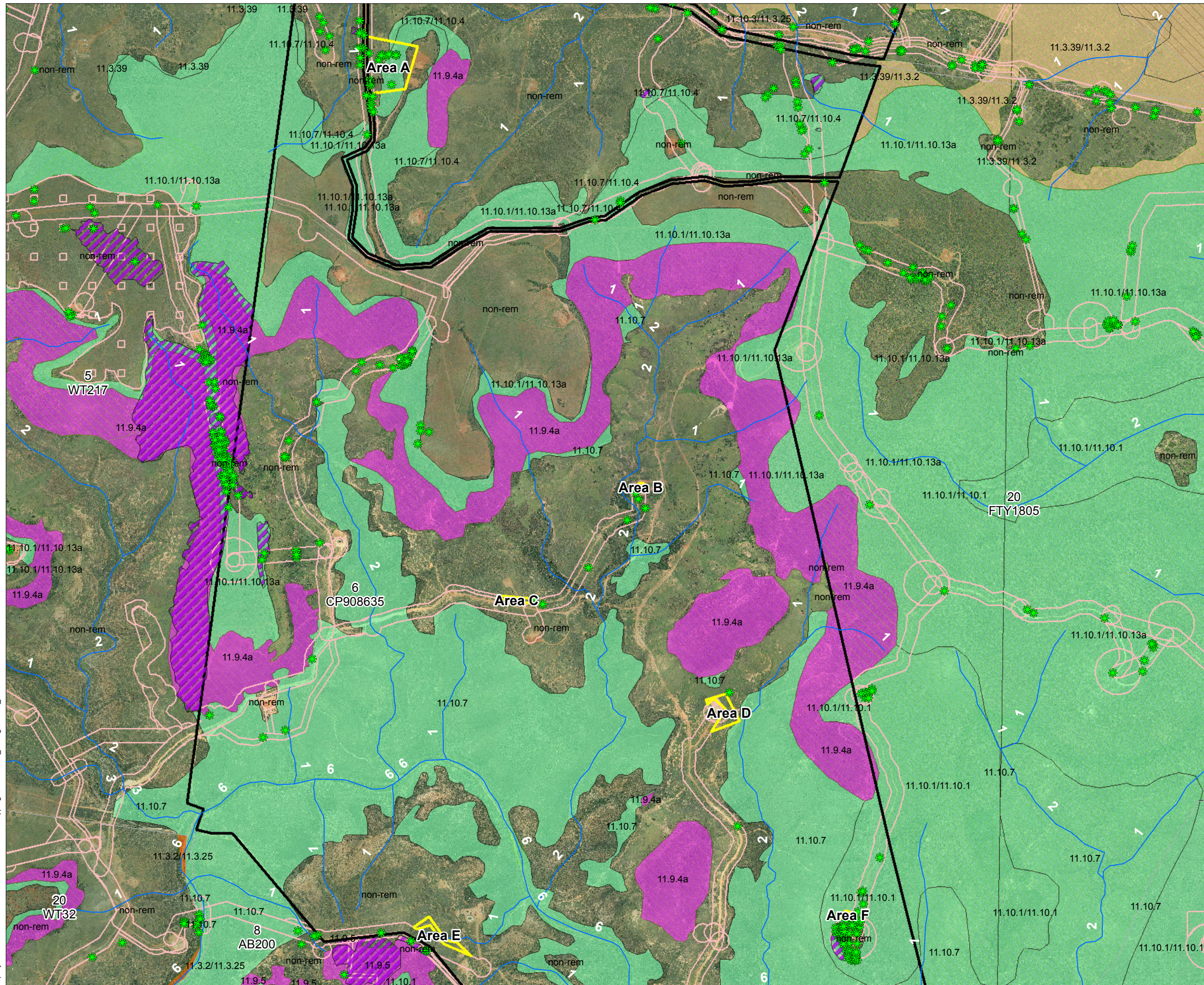
### 1.1 General

Area A contains non-remnant vegetation, but also has a large area of remnant vegetation intersecting the central portion of the proposed development area, as shown in Figure 1.2. This remnant vegetation is mapped as regional ecosystem (RE) 11.10.1/10.10.13a and 11.10.7/11.10.4.

There is a Category B Environmentally Sensitive Areas (ESA) mapped 160 m to the east of Area A. This ESA corresponds to the location of a mapped remnant endangered RE (11.9.4a).

The proposed development area of Area A included the top of a ridge (near an existing quarry site – Fairview West Quarry), the ridge slope and the cleared footslope where the terrain levelled out. The vegetated ridge was relatively steep and contained shallow rocky soils. The western edge of Area A was bordered by the Valley Run Road.

A Stream order 2 watercourse is mapped 140 m to the west of Area A.



- Type A and EVNT's
  - Ground Truth Areas
  - EVNT Species Regions
  - Watercourses V2.1
  - Upstream ground truth areas
  - ESA Category A
  - ESA Category B
  - ESA Category C
- Regional Ecosystem (Biodiversity Status)**
- Endangered - Dominant
  - Endangered - Sub-dominant
  - Of Concern - Dominant
  - Of Concern - Sub-dominant
  - Not of Concern

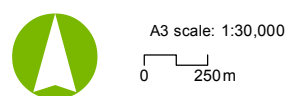
**Notes:**

Notes:

Date: 28/09/2012

Version: 1

Map by: Moore NK P:\Aurecon\215648 Santos\Mapping\6\_CP908635\_Realignments\_Overview.mxd 10/10/2012 12:15:49 PM



Job No: 225678  
Coordinate system: GDA 1994 MGA Zone 55

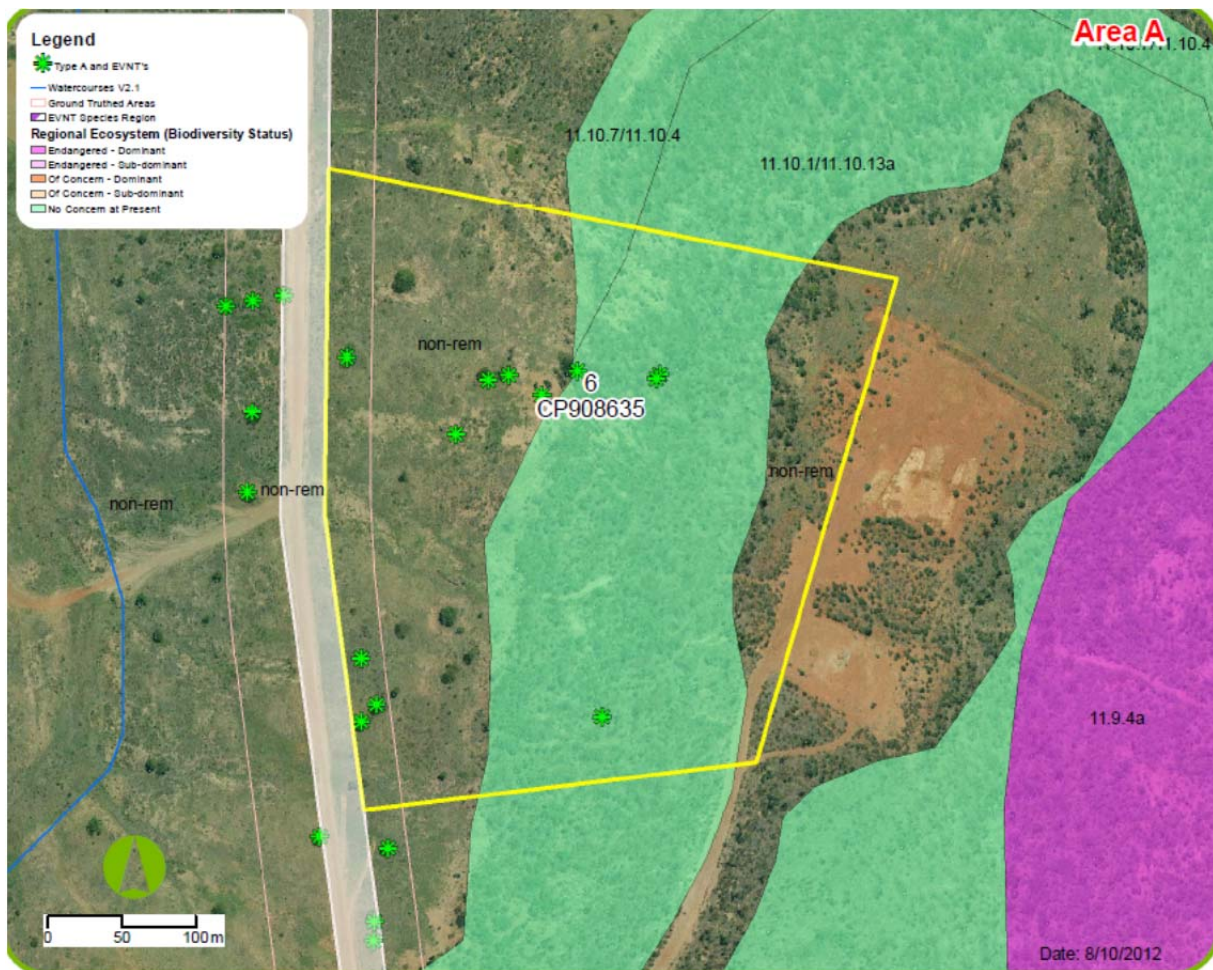


Figure 1.2 Area A showing REs and location of Type A restricted plants

## 1.2 Floristics

The footslopes on the western side of Area A have been previously cleared, and contained isolated mature trees and regrowth vegetation. The canopy layer of mature trees was sparse with approximately 5% cover, and consisted of *Brachychiton populneus* (Kurrajong), *Eucalyptus melanophloia* (Silver leaved ironbark), *Corymbia clarksoniana* (Clarkson's bloodwood) and *Corymbia tessellaris* (Moreton bay ash). The tree height ranged from 8 to 17 m, with an average height of 10 m.

A lower tree layer (4 to 7 m high) was also evident, however it was sparse and provided approximately 5% cover. Species in this stratum included *Eucalyptus melanophloia* (Silver-leaved ironbark), *Corymbia tessellaris* (Moreton bay ash), *Eucalyptus microcarpa* (Grey box), *Acacia leiocalyx* (Black wattle), *Petalostigma pubescens* (Quinine) and *Geijera parviflora* (Wilga), with some *Croton insularis* (Croton) occurring on the upper slope.

A diverse range of species was present within the shrub layer, and included *Dodonaea viscosa* (Sticky hopbush), *Eremophila mitchellii* (False sandalwood), *Grevillea striata* (Beefwood), *Geijera parviflora* (Wilga), *Senna artemisioides* (Silver cassia), *Cassinia laevis* (Cough bush), *Acacia decora* (Pretty wattle), *Capparis loranthifolia* (Nipan), *Alectryon oleifolius* (Boonaree), *Atalaya hemiglauca* (Whitewood), *Maytenus cunninghamii* (Yellow berry bush), *Carissa ovata* (Currant bush) and *Owenia*

*acidula* (Emu apple). The shrub layer provided approximately 30% cover, and ranged in height from 1 to 3 m.

The ground layer was dominated by native grasses, including *Bothriochloa bladhii* (Forest bluegrass), *Aristida jerichoensis* (Jericho wiregrass), *Sporobolus creber* (Western rats tail grass), *Enteropogon ramosus* (Twirly windmill grass), *Chloris ventricosa* (Tall chloris), *Dichanthium sericeum* (Queensland bluegrass), *Themeda triandra* (Kangaroo grass) and *Cymbopogon refractus* (Barbwire grass). Other associated ground layer species included *Verbena tenuisecta* (Mayne's curse), *Senecio lautus* (Fireweed), *Cirsium vulgare* (Spear thistle), *Gomphocarpus physocarpus* (Balloon cotton bush), *Neptunia gracillis* (Native sensitive plant), *Pennisetum ciliare* (Buffel grass), *Oxalis stricta* (Yellow wood sorrel) and *Malvastrum americanum* (Spiny malvastrum). The ground stratum provided approximately 85% cover, with a height range of 0.2 m to 1.2 m. Exotic species comprised approximately 15% of the total ground layer.

An example of the vegetation located in the non-remnant portion of Area A is shown in Photo 1.1.



Photo 1.1 Typical vegetation located on the non-remnant footslope of Area A

An area at the top of the ridge was also mapped as non-remnant vegetation, and had been cleared in association with an existing quarry (Fairview West Quarry). The entire side of the ridge, from the quarry to the footslope, contained remnant vegetation. Along the top of the ridge, *Acacia shirleyi* (Lancewood), *Corymbia clarksoniana* (Clarkson's bloodwood), *Eucalyptus crebra* (Narrow leaved ironbark) and *Angophora leiocarpa* (Smooth-barked apple) formed a canopy with a height range of 14 to 20 m and approximately 25% cover. Further down the slope, *Eucalyptus crebra* (Narrow leaved ironbark) became locally dominant.

A lower tree layer of *Callitris glaucophylla* (White cypress pine) and *Acacia leiocalyx* (Black wattle) dominated, with associated species including *Lysicarpus angustifolius* (Budgeroo), *Jacksonia scoparia*

(Jacksonia), *Bursaria spinosa* (Prickly pine) and *Owenia acidula* (Emu apple). The sub-canopy stratum had a height range of 5 to 10 m, with an average height of 7 m.

The shrub layer contained a diverse composition of species, including *Alphitonia excelsa* (Red ash), *Callitris glaucophylla* (White cypress pine), *Acacia leiocalyx* (Black wattle), *Psydrax oleifolia* (Hatstand), *Carissa ovata* (Currant bush), *Cassinia laevis* (Cough bush), *Geijera parviflora* (Wilga), *Dodonaea triangularis* (Fan hobbush), *Petalostigma pubescens* (Quinine), *Acacia complanata* (Velvet wattle), *Backhousia angustifolia* (Grey myrtle) and *Pittosporum spinescens* (Wallaby apple).

Table 1.1 provides the heights, Foliage Projective Cover (FPC) and stem counts calculated for the canopy, sub-canopy and shrub layers (adapted from Eyre *et al* 2011, refer Appendix D).

Table 1.1 Heights, FPC and stem counts for the remnant vegetation of Area A

Stratum	Height	FPC (%)	Stem count (stems/ha)
Canopy	14-20 m	58.2	140
Sub-canopy	5-10 m	30.6	290
Shrub	1-3 m	N/A	170

Some species known to be associated with Semi-evergreen vine thicket (SEVT) were recorded in a sheltered gully within the area. These species included *Croton insularis* (Croton), *Flindersia australis* (Crows ash), *Notelaea microcarpa* (Native olive), *Petalostigma pubescens* (Quinine) and *Carissa ovata* (Currant bush). The canopy was still dominated by *Eucalyptus crebra* (Narrow leaved ironbark) which was the ecologically dominant layer (EDL). Therefore the area was not considered to be a SEVT threatened ecological community (TEC).

The ground layer was diverse and dominated by native species. Species included *Aristida calycina* (Dark wiregrass), *Aristida caput-medusa* (Many-headed wiregrass), *Eragrostis elongata* (Clustered lovegrass), *Swainsona luteola* (Dwarf darling pea), *Maireana microphylla* (Small-leaf bluebush), *Thyridolepis mitchelliana* (Mulga mitchell grass), *Sida fibulifera* (Pin sida), *Lomandra multiflora* (Lomandra), *Gahnia aspera* (Gahnia), *Enneapogon gracillis* (Slender bottlewashers) and *Keraudrenia collina* (Keraudrenia).

The RE on the lower slope in the northern portion of the remnant vegetation of Area A is mapped as 11.10.7/11.10.4, while the remainder of the remnant vegetation is mapped as 11.10.1/11.10.13a. Long descriptions of these REs are provided in Table 1.2. The vegetation on the lower slopes is consistent with the description for RE 11.10.7, while on the upper slopes the remnant vegetation closely resembled the description of RE 11.10.4a in the northern portion of Area F, and RE 11.10.7 in the southern portion. The vegetation present did not match the descriptions for RE 11.10.1 or 11.10.13, so the correct REs are considered to be RE 11.10.4a/11.10.7 on the upper slopes, grading to RE 11.10.7 on the lower slopes. All of these REs have the same 'no concern at present' biodiversity status.

Table 1.2 Long descriptions of Res 11.10.1, 11.10.4, 11.10.7 and 11.10.13, which are mapped in Area A

RE	Biodiversity Status	Description
11.10.1	No concern at present	<p><i>Corymbia citriodora</i> predominates and forms a distinct but discontinuous open-forest (to woodland) canopy (20-30 m high). On rocky slopes, <i>Eucalyptus crebra</i> and <i>C. hendersonii</i> may be scattered throughout the canopy. On flats and footslopes, scattered <i>E. crebra</i>, <i>C. clarksoniana</i> and <i>C. tessellaris</i> may occur. <i>Corymbia trachyphloia</i> and <i>E. cloeziana</i> often occur on crests and plateaus while <i>E. apothalassica</i> and <i>E. longirostrata</i> sometimes occur in moister microhabitats. Scattered tall to low shrubs, such as <i>Acacia leiocalyx</i>, <i>Acacia spp.</i>, <i>Bursaria spinosa</i>, <i>Persoonia falcata</i>, <i>Alphitonia excelsa</i>, <i>Petalostigma pubescens</i> and <i>Xanthorrhoea johnsonii</i> are usually present and sometimes form a conspicuous layer. The ground layer varies from sparse to moderately dense (depending on the rockiness) and is dominated by perennial grasses. Occurs on hills and ranges, particularly on colluvial lower slopes, formed from medium to coarse-grained sediments (usually sandstone). Associated soils are often texture contrast with a thin sandy or loamy surface horizon and some uniform sandy and lithosol soils. (BVG1M: 10a)</p> <p>Major vegetation communities include:</p> <p>11.10.1a: <i>Corymbia watsoniana</i> +/- <i>C. citriodora</i>, +/- <i>C. trachyphloia</i> +/- <i>C. henryi</i> woodland. (BVG1M: 12a)</p> <p>11.10.1b: <i>Eucalyptus mediocris</i> woodland. (BVG1M: 12a)</p> <p>11.10.1c: <i>Eucalyptus fibrosa</i>, <i>Eucalyptus spp.</i> woodland. (BVG1M: 12a)</p> <p>11.10.1d: <i>Eucalyptus crebra</i> woodland. (BVG1M: 12a)</p>
11.10.4	No concern at present	<p><i>Eucalyptus decorticans</i> predominates forming a distinct but discontinuous canopy (25-30 m high). <i>Eucalyptus decorticans</i> usually forms pure stands, however other <i>Eucalyptus spp.</i> often form part of the canopy and dominate Other tree species that may be present and/or dominant include <i>Acacia shirleyi</i>, <i>Angophora leiocarpa</i>, <i>Callitris glaucophylla</i>, <i>Eucalyptus apothalassica</i>, <i>Lysicarpus angustifolius</i>, <i>E. exserta</i>, <i>E. fibrosa subsp. nubila</i>, <i>E. panda</i>, <i>E. tenuipes</i>, <i>Corymbia trachyphloia</i>, and <i>E. virens</i>. On very rocky shallow soils, <i>Eucalyptus bakeri</i>, <i>E. curtisii</i> or <i>E. viridis</i> may occur. <i>Acacia shirleyi</i> is the most frequent tall shrub, although other <i>Acacia spp.</i> may be locally dominant. There is usually a low tree or tall shrub layer dominated by species such as <i>Acacia sparsiflora</i>, <i>A. burrowii</i>, <i>Callitris endlicheri</i>, <i>Allocasuarina inophloia</i>, <i>Acacia spp.</i>, <i>Eucalyptus tenuipes</i>, <i>Alphitonia excelsa</i> and <i>Petalostigma pubescens</i>. A low shrub layer is not usually present, however where it occurs <i>Acacia spp.</i> and <i>Dodonaea triangularis</i> usually predominate. The ground layer is sparse to open, and dominated by perennial grasses, usually <i>Aristida spp.</i> or <i>Arundinella nepalensis</i>. Occurs on crests, scarps and upper slopes of ranges formed from medium to coarse-grained sediments with shallow soils. (BVG1M: 12a)</p> <p>Major vegetation communities include:</p> <p>11.10.4a: <i>Eucalyptus crebra</i>, <i>Corymbia aureola</i>, <i>C. clarksoniana</i> and/or <i>Acacia shirleyi</i> woodland. Small areas that occur on conjunction with <i>E. decorticans</i> woodland. (BVG1M: 12a)</p> <p>11.10.4b: <i>Eucalyptus crebra</i>, <i>Eucalyptus exserta</i> woodland. Small areas that occur on conjunction with <i>E. decorticans</i> woodland. Occurs on undulating terrain and occasionally on ridgetops. (BVG1M: 12a)</p> <p>11.10.4c: <i>Eucalyptus crebra</i>, <i>Corymbia hendersonii</i> woodland. Small areas that occur on conjunction with <i>E. decorticans</i> woodland. Occurs on undulating terrain and occasionally on ridgetops. (BVG1M: 12a)</p> <p>11.10.4d: <i>Flindersia collina</i> +/- <i>Eucalyptus crebra</i> Occurs on steep hills and</p>

RE	Biodiversity Status	Description
		dissected plateaux (BVG1M: 12a)
11.10.7	No concern at present	<p><i>Eucalyptus crebra</i> and/or <i>E. melanophloia</i> +/- <i>E. populnea</i> shrubby woodland. <i>Eucalyptus melanophloia</i> and/or <i>E. crebra</i> predominate and form a distinct but open canopy. <i>E. populnea</i> is commonly present and may be locally dominant particularly on lower slopes. A low tree to tall shrub layer usually dominated by a range of species including <i>Eremophila mitchellii</i>, <i>Acacia decora</i>, <i>A. longispicata</i> spp. <i>longispicata</i> and <i>A. excelsa</i> is present. A low shrub layer with <i>Petalostigma pubescens</i> and other species is formed in places. The ground layer is variable in cover and composition, but composed mainly of grasses. Occurs on the lower slopes of scarp retreats, associated with dissected tablelands. Associated soils are generally moderately deep, acidic, sandy, yellow earths and sandy-surfaced texture contrast soils formed from medium to coarse-grained sediments. (BVG1M: 12a)</p> <p>Major vegetation communities include:            11.10.7a: <i>Eucalyptus crebra</i> +/- <i>Callitris glaucophylla</i> +/- <i>Angophora leiocarpa</i> +/- <i>Eucalyptus</i> spp. woodland. <i>Eucalyptus crebra</i> predominates and forms a distinct but discontinuous canopy (16-20 m high). In places, <i>Angophora leiocarpa</i> forms part of the canopy. The low tree layer (12-16 m high) is dominated by <i>Callitris glaucophylla</i>. Scattered tall and low shrubs may be present. The ground layer is open to dense, and dominated by perennial grasses, usually <i>Aristida</i> spp. or <i>Themeda triandra</i>.</p>
11.10.13	No concern at present	<p>Open-forest (to woodland) with a range of canopy species including <i>Eucalyptus cloeziana</i>, <i>E. melanoleuca</i>, <i>E. sphaerocarpa</i>, <i>Corymbia bunites</i>, <i>C. hendersonii</i>, <i>C. trachyphloia</i>, <i>E. suffulgens</i>, <i>C. leichhardtii</i>, <i>C. citriodora</i>, <i>E. baileyana</i>. Occurs on sandstone scarps and tablelands with shallow soils formed from medium to coarse-grained sediments. (BVG1M: 12a)</p> <p>Major vegetation communities include:            11.10.13a: <i>Eucalyptus cloeziana</i> +/- <i>E. melanoleuca</i> +/- <i>Corymbia bunites</i> +/- <i>E. sphaerocarpa</i> woodland to open-forest. (BVG1M: 12a)            11.10.13b: <i>Corymbia leichhardtii</i> woodland. (BVG1M: 12a)</p>

An example of the vegetation located in the remnant vegetation within Area A is shown in Photo 1.2.



Photo 1.2 Typical vegetation located in the mapped remnant vegetation on the side of a ridge within Area A

*Opuntia tomentosa* (Velvety tree pear) and *Opuntia stricta* (Prickly pear) were observed within the Area A proposed development area. These species are listed as Class 2 pests declared under the provisions of the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).

Twelve Type A restricted plants were recorded within Area A. Their GPS locations are provided in Table 1.3. An assessment of the relocation potential of each individual is provided as Appendix C.

Table 1.3 Location of Type A restricted plants in Area A

Species	Common name	Easting (GDA94, zone 55)	Northing (GDA94, zone 55)	Comment
<i>Brachychiton populneus</i>	Kurrajong	695976	7163712	
<i>Brachychiton populneus</i>	Kurrajong	695985	7163465	insect attack evident on trunk - clear exudate
<i>Brachychiton populneus</i>	Kurrajong	695995	7163476	insect attack - yellow exudate, holes in bark
<i>Brachychiton populneus</i>	Kurrajong	695985	7163508	juvenile
<i>Brachychiton populneus</i>	Kurrajong	696050	7163659	2 plants 5 stems total
<i>Brachychiton populneus</i>	Kurrajong	696086	7163700	insect attack - clear exudate, holes in trunk
<i>Brachychiton populneus</i>	Kurrajong	696107	7163687	3 plants 5 stems
<i>Brachychiton populneus</i>	Kurrajong	696132	7163703	<i>Brachychiton rupestris</i> hybrid



Species	Common name	Easting (GDA94, zone 55)	Northing (GDA94, zone 55)	Comment
<i>Brachychiton populneus</i>	Kurrajong	696071	7163697	
<i>Brachychiton populneus</i>	Kurrajong	696149	7163468	
<i>Brachychiton rupestris</i>	Narrow-leaved bottle tree	696188	7163701	growing amongst rocks
<i>Brachychiton populneus</i>	Kurrajong	696186	7163698	

No other species of conservation significance as listed under the provisions of the NC Act and/or the EPBC Act were recorded during site investigations.

A list of botanical species recorded within the development area is provided in Appendix A.

### 1.3 Habitat value

The habitat value within the remnant portion of Area A is high. This area contains numerous living Angophora and Eucalyptus trees bearing hollows, fallen timber including hollow logs, and standing hollow stags, particularly near the top of the ridge. These may provide shelter and nesting opportunities for arboreal and terrestrial mammals, reptiles and hollow-dependent birds. Dense leaf litter in association with stands of Acacia shrubs may provide excellent habitat for reptiles. Additionally, the following features contribute to the high habitat value of the remnant portion of Area A:

- Canopy vegetation for shelter, foraging and perching purposes
- Fissured and peeling bark suitable for providing shelter opportunities for microbats, reptiles and invertebrates
- Fallen woody debris, including hollow logs suitable for providing shelter opportunities for small mammals and reptiles
- Rocky crevices and outcrops suitable for a range of reptiles

The habitat value in the non-remnant area on the footslope of Area A (the western portion adjacent to Valley Run Road) is moderate, with fewer canopy trees, and no rocky crevices. However, abundant shrubs and ground cover was present at this location. Hollow logs scatter the ground, providing potential habitat for small to medium-sized mammals, and reptiles. Floristic diversity in the shrub layer is high, so would support a range of avian fauna.

A list of incidental fauna species recorded within all development areas in this assessment is provided in Appendix B.

Diggings typical of the Short-beaked Echidna (*Tachyglossus aculeatus*) were noted in the remnant portion of Area A. This species is listed as 'Special Least Concern' under the provisions of the NC Act.

No other fauna species of conservation significance as listed under the provisions of the NC Act and/or EPBC Act were observed within the proposed development area.

## 2 Ecological assessment of Area B, C, D & E

### 2.1 General

Areas B, C, D and E are currently mapped as entirely non-remnant vegetation on the Regional Ecosystem (RE) mapping, which is certified by the Department of Environment and Heritage Protection (DEHP). Ground-truthing of these areas confirmed the RE mapping to be correct.

Areas B, C, D and E are shown in Figure 2.1, Figure 2.2, Figure 2.3, and Figure 2.4, respectively.

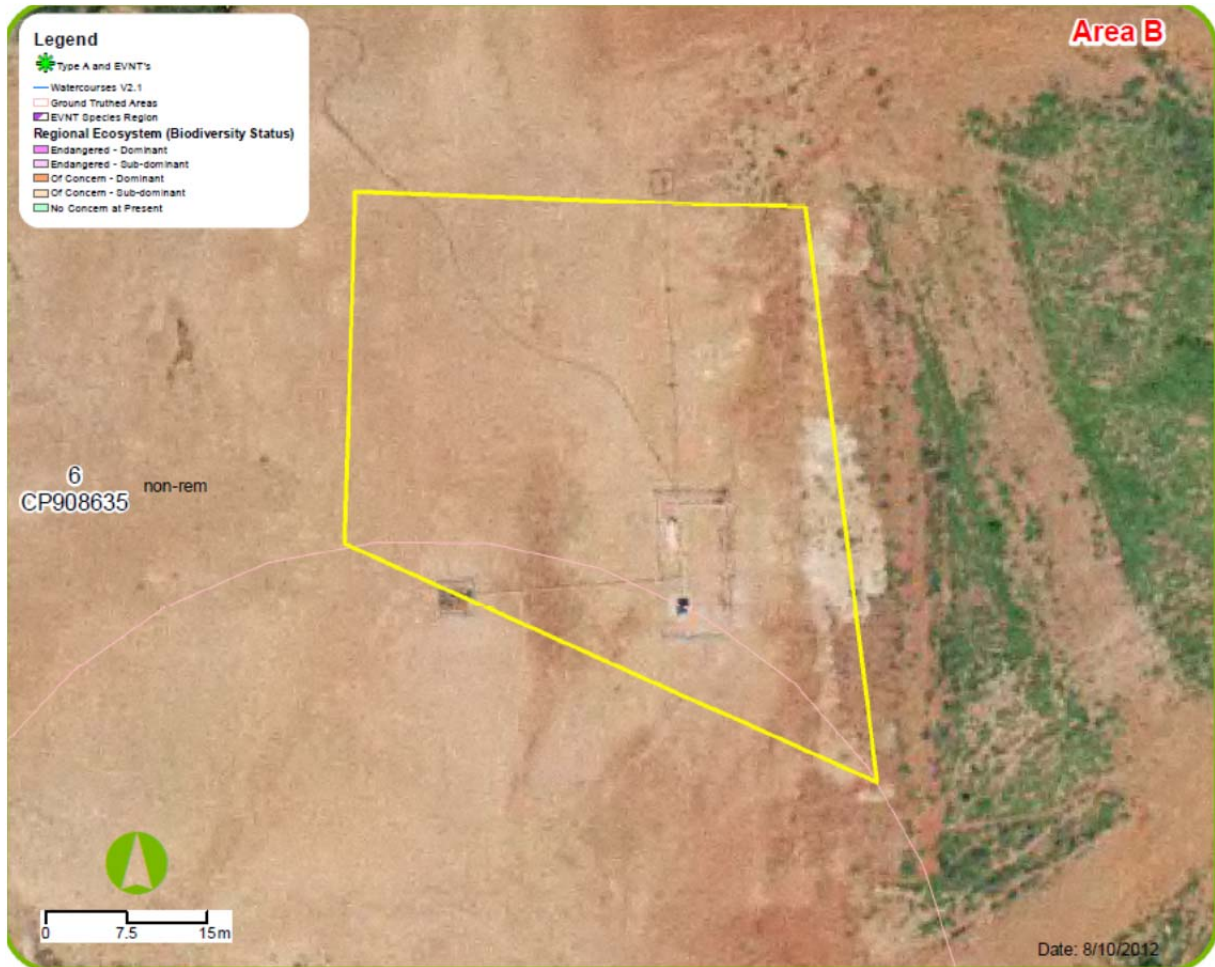


Figure 2.1 Area B showing REs, ESAs and location of Type A restricted plants

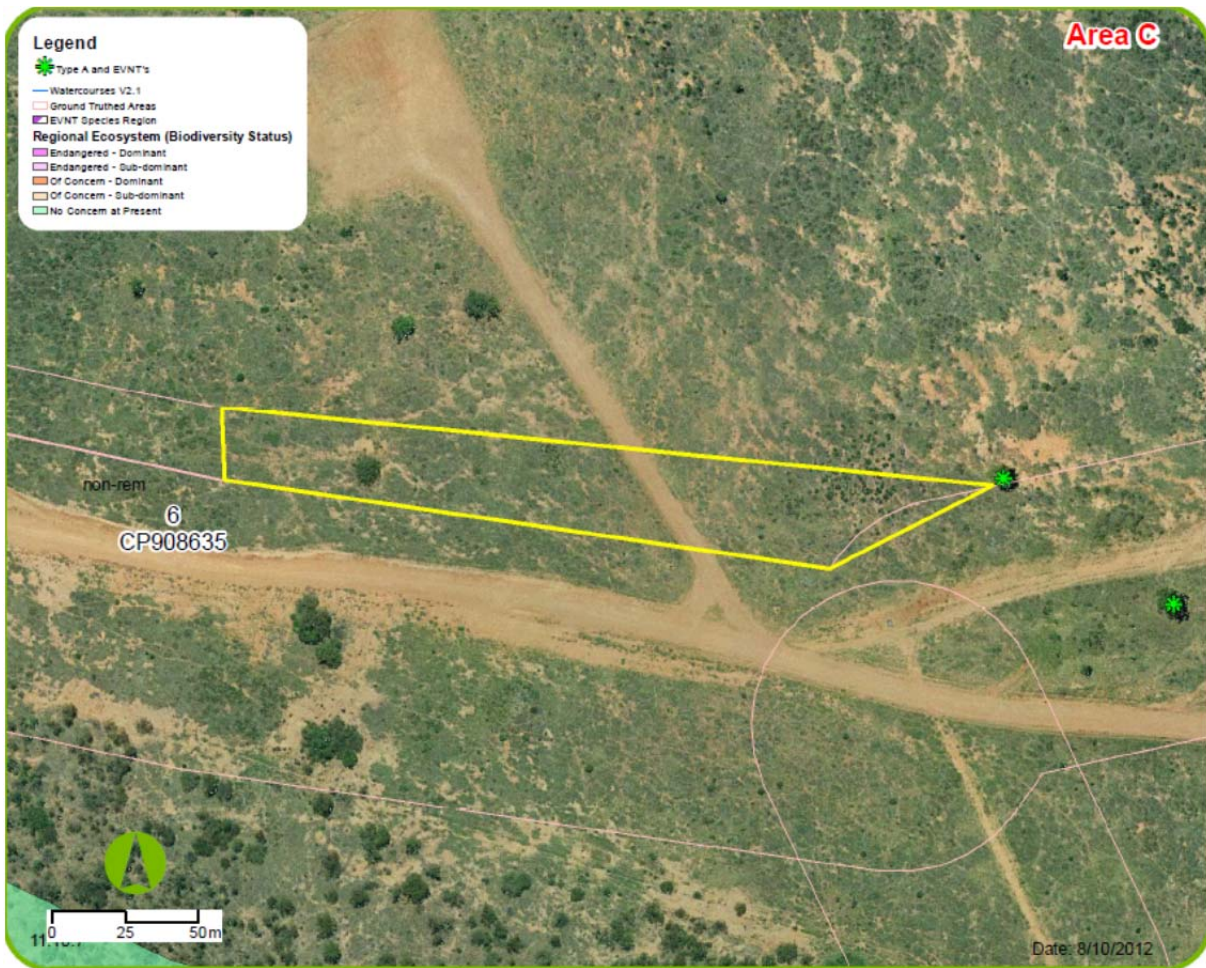


Figure 2.2 Area C showing REs, ESAs and location of Type A restricted plants

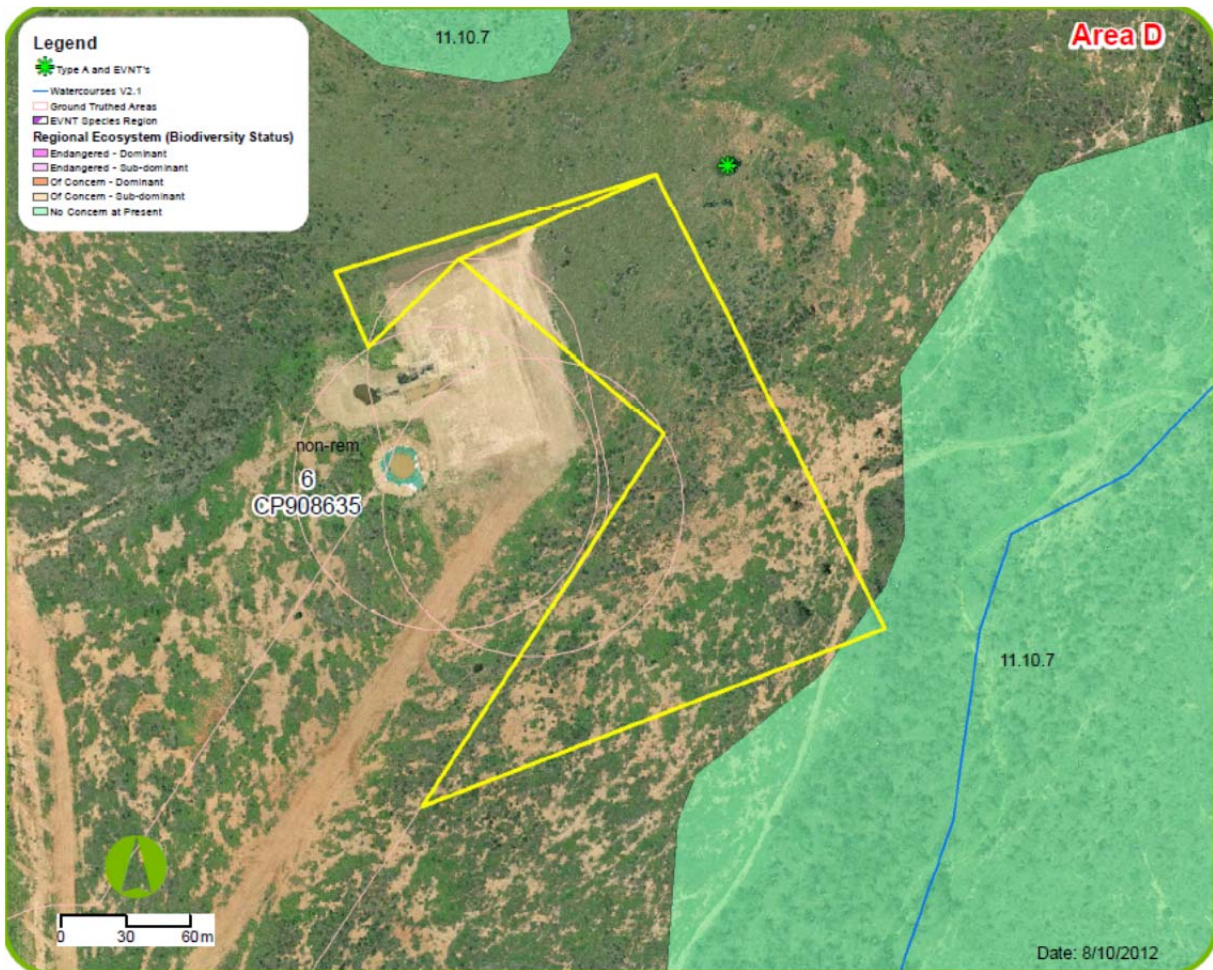


Figure 2.3 Area D showing REs, ESAs and location of Type A restricted plants

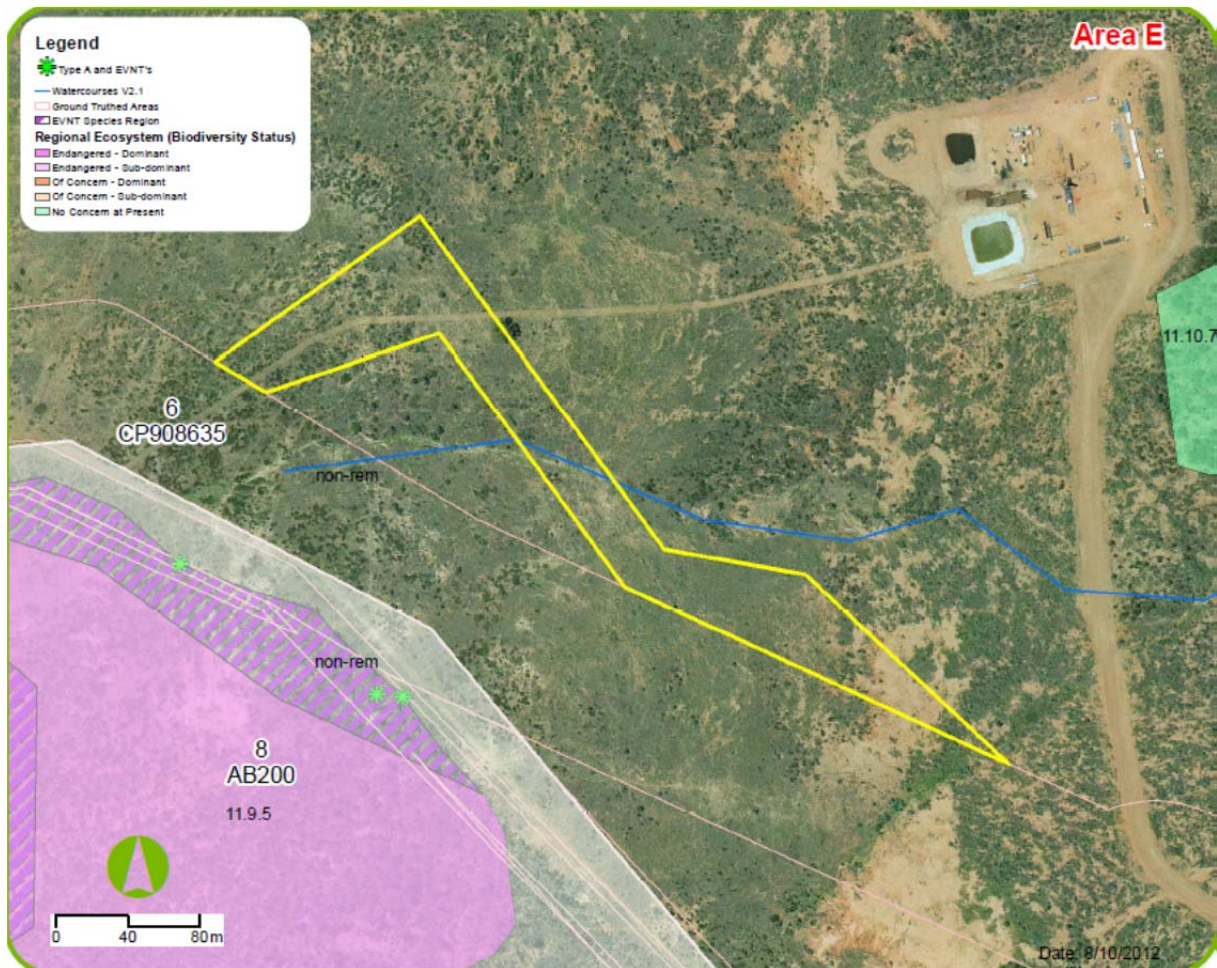


Figure 2.4 Area E showing REs, ESAs and location of Type A restricted plants

There is a Category B ESA mapped 130 m to the south of Area E, which corresponds to the mapped remnant 'endangered' RE 11.9.5.

There is one mapped watercourse which intersects the proposed development area of Area E. This watercourse is classified as a Stream order 1. There are no mapped watercourses located within the other proposed development areas. A Stream order 2 watercourse occurs 50 m to the east of Area D.

Area B was located within a previously developed well site, and was completely devoid of woody vegetation. Areas C to D were located on cleared undulating hills. A recently cleared corridor was observed at Area E, which followed the alignment of the proposed development area. Only a small section of Area E (near the access road) had not been cleared.

## 2.2 Floristics

Area B was devoid of woody vegetation (refer Photo 2.1). Canopy cover was largely absent in Areas C, D and E (refer Photo 2.2 and Photo 2.3), with the exception of one mature *Geijera parviflora* (Wilga) in Area C and one mature *Eucalyptus decorticans* (Gum-topped ironbark) in Area E. The shrub layer was generally sparse in each of these areas, but contained a range of species, including *Dodonaea viscosa* (Sticky hopbush), *Eremophila mitchellii* (False sandalwood), *Eremophila longifolia* (Emu bush), *Geijera parviflora* (Wilga), *Cassinia laevis* (Cough bush), *Acacia decora* (Pretty wattle), *Capparis mitchellii* (Bumble tree), *Alectryon diversifolius* (Scrub boonaree) *Alectryon oleifolius* (Boonaree),

*Atalaya hemiglauca* (Whitewood), *Maytenus cunninghamii* (Yellow berry bush), *Carissa ovata* (Currant bush) and *Owenia acidula* (Emu apple).

The ground layer contained a mix of native and non-native grasses, forbs and herbs, including *Pennisetum ciliare* (Buffel grass), *Aristida jerichoensis* (Jericho wiregrass), *Sporobolus creber* (Western rats tail grass), *Chloris ventricosa* (Tall chloris), *Dichanthium sericeum* (Queensland bluegrass), *Themeda triandra* (Kangaroo grass) and *Cymbopogon refractus* (Barbwire grass). Other associated ground layer species included *Verbena tenuisecta* (Mayne's curse), *Senecio lautus* (Fireweed), *Cirsium vulgare* (Spear thistle), *Gomphocarpus physocarpus* (Balloon cotton bush), *Oxalis stricta* (Yellow wood Sorrel) and *Malvastrum americanum* (Spiny malvastrum).

*Opuntia tomentosa* (Velvety tree pear) and *Opuntia stricta* (Prickly pear) were present as scattered individuals. These species are listed as Class 2 pests declared under the provisions of the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).

No flora species of conservation significance as listed under the provisions of the NC Act and/or the EPBC Act were recorded in Areas B, C, D or E during site investigations. However, it is noted that two Type A restricted plants were located outside, but very close to the development areas, as described in Table 2.1 (refer Figure 2.2 and Figure 2.3).

Table 2.1 Type A restricted plants in the vicinity of Areas C and D

Species	Common name	Easting (GDA94, zone 55)	Northing (GDA94, zone 55)	Location
<i>Brachychiton populneus</i>	Kurrajong	697254	7159515	On eastern boundary of Area C
<i>Brachychiton rupestris</i>	Narrow-leaved Bottle Tree	698748	7158795	30 m east of Area D



Photo 2.1 Area B



Photo 2.2 Area D looking towards remnant vegetation to the east



Photo 2.3 Area E (cleared corridor)

### 2.3 Habitat Value

The habitat value of Areas B, C, D and E is low, due to the lack of canopy cover, fissured tree bark, rocky crevices and coarse woody debris. The relatively diverse shrub layer would provide some shelter, nesting and food resources to avian fauna. Abundant grass tussocks in the ground layer may provide limited shelter for ground-dwelling mammals and reptiles, but leaf litter was generally sparse. Brown honeyeaters (*Lichmera indistincta*) were observed feeding upon the flowers of *Eremophila longifolia* (Emu bush) in Area C. One inactive bird nest, likely to be that of the Torresian crow (*Corvus orru*), was observed in the mature *Eucalyptus decorticans* (Gum-topped ironbark) in Area E. This tree was located at GPS location 696486 7157009 (GDA94, zone 55).

## 3 Ecological Assessment of Area F

### 3.1 General

Area F is mapped as entirely remnant RE 11.10.1/11.10.1, which is has a 'not of concern at present' biodiversity status (Figure 3.1). No mapped watercourses or ESAs intersect Area F.

Area F was located on the top of a steep ridge next to an existing well site (FV11-13-2,3,4).

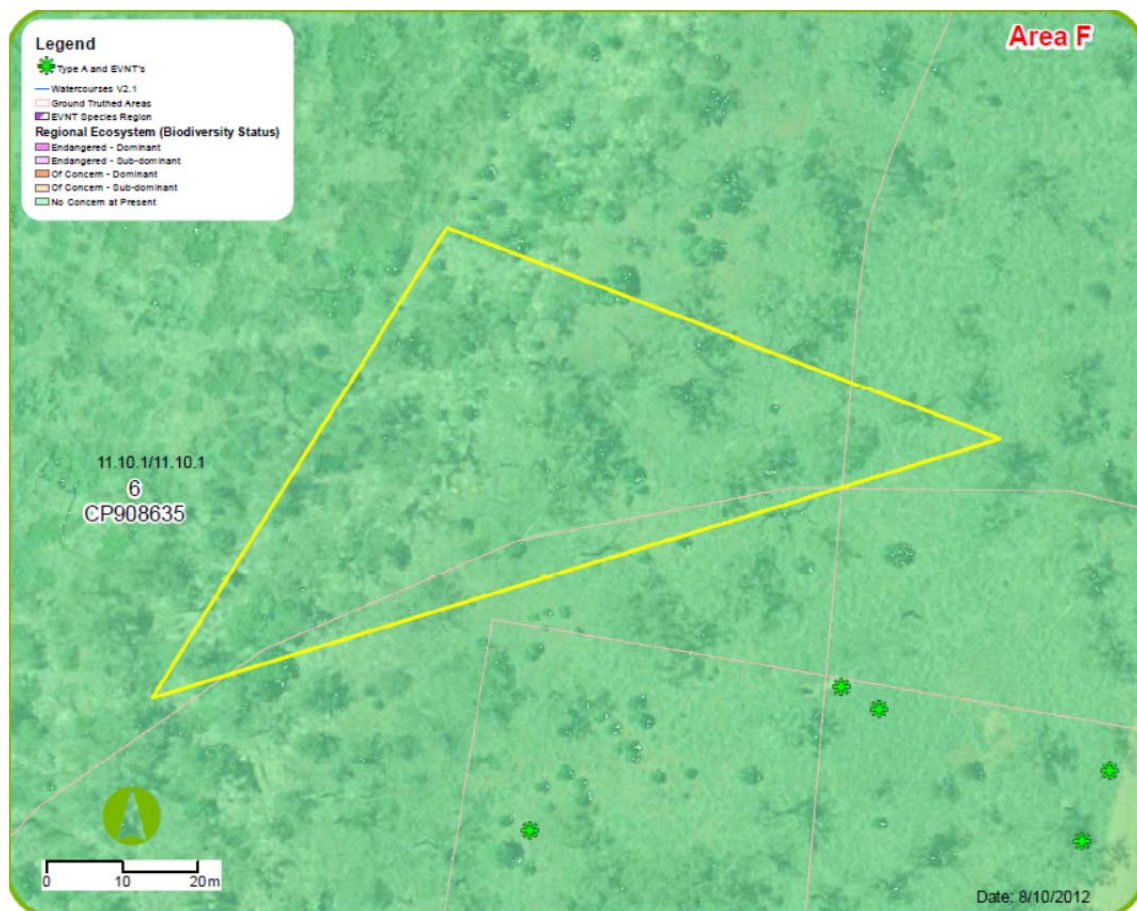


Figure 3.1 Area F showing REs, ESAs and location of Type A restricted plants



### 3.2 Floristics

The canopy layer within Area F ranged in height from 14 m to 18 m, with an average height of 16 m, and provided 10% cover. Canopy species consisted of *Eucalyptus crebra* (Narrow-leaved ironbark), *Callitris glaucophylla* (White cypress pine) and *Corymbia clarksoniana* (Clarkson's bloodwood). *C. glaucophylla* and *Ficus macrophylla* (Moreton bay fig) occurred in the sub-canopy, at an average height of 6 m, with 20% canopy cover.

The shrub layer provided 30% cover, with a height range of 1 m to 3.5 m, and an average height of 2.5 m. Shrub species included *Acacia leiocalyx* (Black wattle), *Acacia longispicata* (Slender-flowered wattle), *Cupaniopsis anacardioides* (Tuckeroo), *Alectryon olieofolius* (Boonaree), *Eucalyptus melanophloia* (Silver-leaved ironbark), *Petalostigma pubescens* (Quinine) and *Pittosporum spinescens* (Wallaby apple).

The ground layer was diverse, and dominated by native grasses and forbs, including *Digitaria breviglumis* (Finger grass), *Austrostipa verticillata* (Slender bamboo grass), *Eragrostis alveiformis* (Granite lovegrass), *Aristida caput-medusa* (Many-headed wiregrass), *Lomandra multiflora* (Lomandra), *Lomandra leucocephala* (Woollyhead matrush), *Dianella longifolia* (Dianella), *Podolepis jaceoides* (Showy copperwire daisy), *Eragrostis elongata* (Clustered lovegrass), *Sida hackettiana* (Queensland hemp), *Wahlenbergia gracilis* (Sprawling bluebell), *Triaphis mollis* (Purple plume grass) and *Eragrostis sororia* (Blue lovegrass).

The RE is mapped as 11.10.1, which is described as '*Corymbia citriodora* open forest on coarse-grained sedimentary rocks', and has a 'no concern at present' biodiversity status. *Corymbia citriodora* was absent from the canopy, and the height of the ecologically dominant layer (EDL) was 14-18 m, which is lower than that described for this RE (20-30 m). Area F has a westerly aspect and occurs on the boundary with RE 11.10.7, which is mapped on the slopes to the west. This RE is described as '*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks' and has a 'no concern at present' biodiversity status. The long descriptions of each of these REs is provided in Table 3.1. The EDL height described for RE 11.10.7a (16-20 m) is consistent with that present in Area F. Further, the dominant sub-canopy species in RE 11.10.7a is *Callitris glaucophylla*, which was present in Area F, albeit lower (6 m) than that recorded in the RE description (12-16 m). The structure and composition of the remnant vegetation in Area F more closely resembles that of RE 11.10.7a, rather than the mapped RE 11.10.1, therefore it is considered that the RE within Area F should be mapped as 11.10.7a. Both REs have the same biodiversity status.

Table 3.1 Long descriptions of Res 11.10.1 and 11.10.7, which are mapped in or near Area F

RE	Biodiversity Status	Description
11.10.1	No concern at present	<p><i>Corymbia citriodora</i> predominates and forms a distinct but discontinuous open-forest (to woodland) canopy (20-30m high). On rocky slopes, <i>Eucalyptus crebra</i> and <i>C. hendersonii</i> may be scattered throughout the canopy. On flats and footslopes, scattered <i>E. crebra</i>, <i>C. clarksoniana</i> and <i>C. tessellaris</i> may occur. <i>Corymbia trachyphloia</i> and <i>E. cloeziana</i> often occur on crests and plateaus while <i>E. apothalassica</i> and <i>E. longirostrata</i> sometimes occur in moister microhabitats. Scattered tall to low shrubs, such as <i>Acacia leiocalyx</i>, <i>Acacia spp.</i>, <i>Bursaria spinosa</i>, <i>Persoonia falcata</i>, <i>Alphitonia excelsa</i>, <i>Petalostigma pubescens</i> and <i>Xanthorrhoea johnsonii</i> are usually present and sometimes form a conspicuous layer. The ground layer varies from sparse to moderately dense (depending on the rockiness) and is dominated by perennial grasses. Occurs on hills and ranges, particularly on colluvial lower slopes, formed from medium to coarse-grained sediments (usually sandstone). Associated soils are often texture contrast with a thin sandy or loamy surface horizon and some uniform sandy and lithosol soils. (BVG1M: 10a)</p> <p>Major vegetation communities include:</p> <p>11.10.1a: <i>Corymbia watsoniana</i> +/- <i>C. citriodora</i>, +/- <i>C. trachyphloia</i> +/- <i>C. henryi</i> woodland. (BVG1M: 12a)</p> <p>11.10.1b: <i>Eucalyptus mediocris</i> woodland. (BVG1M: 12a)</p> <p>11.10.1c: <i>Eucalyptus fibrosa</i>, <i>Eucalyptus spp.</i> woodland. (BVG1M: 12a)</p> <p>11.10.1d: <i>Eucalyptus crebra</i> woodland. (BVG1M: 12a)</p>
11.10.7	No concern at present	<p><i>Eucalyptus crebra</i> and/or <i>E. melanophloia</i> +/- <i>E. populnea</i> shrubby woodland. <i>Eucalyptus melanophloia</i> and/or <i>E. crebra</i> predominate and form a distinct but open canopy. <i>E. populnea</i> is commonly present and may be locally dominant particularly on lower slopes. A low tree to tall shrub layer usually dominated by a range of species including <i>Eremophila mitchellii</i>, <i>Acacia decora</i>, <i>A. longispicata</i> spp. <i>longispicata</i> and <i>A. excelsa</i> is present. A low shrub layer with <i>Petalostigma pubescens</i> and other species is formed in places. The ground layer is variable in cover and composition, but composed mainly of grasses. Occurs on the lower slopes of scarp retreats, associated with dissected tablelands. Associated soils are generally moderately deep, acidic, sandy, yellow earths and sandy-surfaced texture contrast soils formed from medium to coarse-grained sediments. (BVG1M: 12a)</p> <p>Major vegetation communities include:</p> <p>11.10.7a: <i>Eucalyptus crebra</i> +/- <i>Callitris glaucophylla</i> +/- <i>Angophora leiocarpa</i> +/- <i>Eucalyptus spp.</i> woodland. <i>Eucalyptus crebra</i> predominates and forms a distinct but discontinuous canopy (16-20 m high). In places, <i>Angophora leiocarpa</i> forms part of the canopy. The low tree layer (12-16 m high) is dominated by <i>Callitris glaucophylla</i>. Scattered tall and low shrubs may be present. The ground layer is open to dense, and dominated by perennial grasses, usually <i>Aristida spp.</i> or <i>Themeda triandra</i>.</p>

*Opuntia stricta* (Prickly pear) occurred as scattered individuals. This species is listed as a Class 2 pest declared under the provisions of the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).

An example of the vegetation located in Area F is shown in Photo 3.1.



Photo 3.1 Typical vegetation within Area F

### 3.3 Habitat Value

The habitat value of Area F is high, with a range of features providing important resources for native fauna. These include:

- Canopy cover suitable for the provision of shelter, foraging and perching
- Fissured tree bark
- Dense ground cover vegetation (eg grassy tussocks)
- Woody debris (fallen timber and hollow-bearing logs)
- Leaf litter
- Rocky crevices

Scats of *Trichosurus vulpecula* (Brush-tailed possum) were noted within Area F. The area is also likely to support gliders.

Incidental fauna records derived from the site investigation are provided in Appendix B.

No fauna species of conservation significance as listed under the provisions of the NC Act and/or EPBC Act were observed within the proposed development area.

## 4 Conclusion

Areas B, C, D and E of the proposed development area have been extensively cleared, and as a result are mapped as non-remnant vegetation. Area A contains both remnant and non-remnant vegetation, while Area F occurs entirely within remnant vegetation. The REs of remnant vegetation within Area A and Area F are both listed as 'no concern at present' biodiversity status.

No ESAs are mapped within the proposed development area. However, a category B ESA is mapped 160 m to the east of Area A, and a category B ESA is mapped 130 m to the south of Area E.

A stream order 1 watercourse intersects Area E. A Stream order 1 watercourse is mapped 140 m to the west of Area A and a Stream order 2 watercourse is mapped 50 m to the east of Area D.

Twelve Type A restricted plants were recorded in Area A. Evidence of one 'Special Least Concern' species (Short-beaked echidna) was noted within Area A. No other flora or fauna species of conservation significance as listed under the NC Act and/or the EPBC Act were observed within the proposed development area.

The overall habitat value was considered to be high in the remnant areas of Area A and Area F, and low to moderate in the non-remnant areas of Areas B, C, D and E.

## 5 References

Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2011). *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual*. Version 2.1. Department of Environment and Resource Management (DERM), Biodiversity and Ecosystem Sciences, Brisbane.

Pizzey G and Knight F, 1997, *Field Guide to the Birds of Australia*, Harper Collins Publishers, Australia

## Appendix A

### Botanical species recorded within the proposed development area on Lot 6 on CP908635

Family name	Scientific name	Common name	Notes
Adiantaceae	<i>Cheilanthes sieberi</i>	Mulga fern	
Amaranthaceae	<i>Achyranthes aspera</i>	Chaff flower	
Apiaceae	<i>Daucus glochidatus</i>	Wild carrot	
Apiaceae	<i>Hydrocotyle laxiflora</i>	Pennywort	
Apocynaceae	<i>Alstonia constricta</i>	Bitter bark	
Apocynaceae	<i>Carissa ovata</i>	Currant bush	
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon cotton bush	Non-native
Apocynaceae	<i>Marsdenia australis</i>	Marsdenia	
Apocynaceae	<i>Marsdenia lanceolata</i>	Marsdenia	
Apocynaceae	<i>Parsonsia lanceolata</i>	Monkey rope	
Asteraceae	<i>Bidens pilosa</i>	Cobblers pegs	Non-native
Asteraceae	<i>Calocephalus platycephalus</i>	Billy buttons	
Asteraceae	<i>Calotis cuneifolia</i>	Purple burr daisy	
Asteraceae	<i>Calotis lappulacea</i>	Yellow burr daisy	
Asteraceae	<i>Calotis scabiosifolia</i>	Rough daisy burr	
Asteraceae	<i>Cassinia laevis</i>	Cough bush	
Asteraceae	<i>Chrysocephalum apiculatum</i>	Yellow buttons	
Asteraceae	<i>Cirsium vulgare</i>	Spear thistle, black thistle	Non-native
Asteraceae	<i>Conyza bonariensis</i>	Fleabane	Non-native
Asteraceae	<i>Cotula australis</i>	Carrot weed	
Asteraceae	<i>Flaveria australasica</i>	Speedy weed	
Asteraceae	<i>Podolepis jaceoides</i>	Showy copper wire daisy	
Asteraceae	<i>Pterocaulon sphacelatum</i>	Apple bush	
Asteraceae	<i>Rhodanthe polyphylla</i>		
Asteraceae	<i>Senico lautus</i>	Fireweed	
Asteraceae	<i>Sonchus oleraceus</i>	Sow thistle	Non-native
Asteraceae	<i>Xerochrysum bracteatum</i>	Everlasting daisy	

Family name	Scientific name	Common name	Notes
Cactaceae	<i>Opuntia stricta</i>	Prickly pear	Non-native, LP Act Class 2 Weed
Cactaceae	<i>Opuntia tomentosa</i>	Velvety tree pear	Non-native, LP Act Class 2 Weed
Campanulaceae	<i>Wahlenbergia communis</i>	Large bluebells	
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling bluebell	
Capparaceae	<i>Apophyllum anomalum</i>	Warrior bush	
Capparaceae	<i>Capparis canescens</i>	Wild orange	
Capparaceae	<i>Capparis loranthifolia</i>	Nipan, wait a while	
Capparaceae	<i>Capparis mitchellii</i>	Bumble fruit	
Celastraceae	<i>Elaeodendron australe</i> <i>var. integrifolium</i>		
Celastraceae	<i>Maytenus cunninghamii</i>	Yellow berry bush	
Chenopodiaceae	<i>Chenopodium desertorum</i>	Desert goosefoot	
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaf bluebush	
Chenopodiaceae	<i>Sclerolaena birchii</i>	Galvanised burr	
Convolvulaceae	<i>Dichondra repens</i>	Kidney weed	
Cupressaceae	<i>Callitris glaucophylla</i>	White cypress pine	
Cyperaceae	<i>Cyperus difformis</i>	Dirty dora	
Cyperaceae	<i>Cyperus haspan</i>		
Cyperaceae	<i>Fimbristylis dichotoma</i>	Fimbristylis	
Cyperaceae	<i>Gahnia aspera</i>	Gahnia	
Euphorbiaceae	<i>Croton insularis</i>	Silver croton	
Fabaceae - Caesalpinioideae	<i>Senna artemisioides</i>	Senna	
Fabaceae - Faboideae	<i>Desmodium varians</i>	Trefoil	
Fabaceae - Faboideae	<i>Glycine tabacina</i>	Glycine pea	
Fabaceae - Faboideae	<i>Hovea longipes</i>	Hovea	
Fabaceae - Faboideae	<i>Indigofera adesmiifolia</i>	Tick indigo	
Fabaceae - Faboideae	<i>Indigofera australis</i>	Austral indigo, hill indigo	
Fabaceae - Faboideae	<i>Indigofera hirsuta</i>	Hairy indigo	
Fabaceae - Faboideae	<i>Jacksonia scoparia</i>	Jacksonia	
Fabaceae - Faboideae	<i>Lotus australis</i>	Lotus, birdsfoot trefoil	

Family name	Scientific name	Common name	Notes
Fabaceae - Faboideae	<i>Swainsona galegifolia</i>	Swainsona	
Fabaceae - Faboideae	<i>Swainsona luteola</i>	Dwarf darling pea	
Fabaceae - Mimosoideae	<i>Acacia complanata</i>	Velvet wattle	
Fabaceae - Mimosoideae	<i>Acacia deanei</i>	Dean's wattle	
Fabaceae - Mimosoideae	<i>Acacia decora</i>	Pretty wattle	
Fabaceae - Mimosoideae	<i>Acacia excelsa</i>	Iron wood	
Fabaceae - Mimosoideae	<i>Acacia harpophylla</i>	Brigalow	
Fabaceae - Mimosoideae	<i>Acacia jucunda</i>	Hairy wattle	
Fabaceae - Mimosoideae	<i>Acacia leiocalyx</i>	Black wattle	
Fabaceae - Mimosoideae	<i>Acacia longispicata</i>	Slender-flowered wattle	
Fabaceae - Mimosoideae	<i>Acacia macradenia</i>	Zigzag wattle	
Fabaceae - Mimosoideae	<i>Acacia shirleyi</i>	Lancewood	
Geraniaceae	<i>Erodium cicutarium</i>	Common storks bill	
Goodeniaceae	<i>Goodenia glabra</i>	Smooth goodenia	
Goodeniaceae	<i>Scaevola aemula</i>	Fairy fan-flower	
Juncaceae	<i>Juncus usitatus</i>	Juncus	
Lomandraceae	<i>Lomandra leucocephala</i>	Woolly-head mat rush	
Lomandraceae	<i>Lomandra multiflora</i>	Lomandra	
Luzuriagaceae	<i>Eustrephus latifolia</i>	Wombat berry	
Malvaceae	<i>Hibiscus brachysiphonius</i>	Bush hibiscus	
Malvaceae	<i>Hibiscus sturtii</i>	Hills hibiscus	
Malvaceae	<i>Malvastrum americanum</i>	Spiny malvastrum	Non-native
Malvaceae	<i>Sida cordifolia</i>	Flannel weed	Non-native
Malvaceae	<i>Sida fibulifera</i>	Pin sida	
Malvaceae	<i>Sida rohlenae</i>	Shrub sida	
Malvaceae	<i>Sida hackettiana</i>	Queensland hemp	
Meliaceae	<i>Owenia acidula</i>	Emu apple	
Mimosaceae	<i>Neptunia gracillis</i>	Native sensitive plant	
Moraceae	<i>Ficus macrophylla</i>	Moreton bay fig	
Myoporaceae	<i>Eremophila bignoniiflora</i>	Dogwood	
Myoporaceae	<i>Eremophila debilis</i>	Winter apple	
Myoporaceae	<i>Eremophila mitchellii</i>	False sandalwood	
Myoporaceae	<i>Myoporum acuminatum</i>	Boobialla	
Myoporaceae	<i>Myoporum montanum</i>	Western boobialla	

Family name	Scientific name	Common name	Notes
Myrtaceae	<i>Angophora leiocarpa</i>	Smooth-barked apple	
Myrtaceae	<i>Backhousia angustifolia</i>	Grey myrtle	
Myrtaceae	<i>Corymbia clarksoniana</i>	Clarkson's bloodwood	
Myrtaceae	<i>Corymbia tessellaris</i>	Moreton bay ash	
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow leaved ironbark	
Myrtaceae	<i>Eucalyptus decorticans</i>	Gum topped ironbark	
Myrtaceae	<i>Eucalyptus melanophloia</i>	Silver leaved ironbark	
Myrtaceae	<i>Eucalyptus microcarpa</i>	Gum topped box	
Myrtaceae	<i>Lysicarpus angustifolius</i>	Budgeroo	
Oleaceae	<i>Jasminum simplicifolium</i>	Native jasmine	
Oleaceae	<i>Notelaea microcarpa</i>	Native olive	
Oxalidaceae	<i>Oxalis stricta</i>	Yellow wood sorrel	
Passifloraceae	<i>Passiflora aurantia</i> var. <i>aurantia</i>	Red passion flower	
Phormiaceae	<i>Dianella longifolia</i>	Dianella	
Picrodendraceae	<i>Petalostigma pubescens</i>	Quinine	
Pittosporaceae	<i>Bursaria spinosa</i>	Prickly pine	
Pittosporaceae	<i>Pittosporum spinescens</i>	Wallaby apple	
Plantaginaceae	<i>Plantago cunninghamii</i>	Sago weed	
Poaceae	<i>Aristida calycina</i>	Dark wiregrass	
Poaceae	<i>Aristida caput medusa</i>	Many-headed wire grass	
Poaceae	<i>Aristida holathera</i>	Tall wire grass	
Poaceae	<i>Aristida jerichoensis</i>	Jericho wire grass	
Poaceae	<i>Aristida latifolia</i>	Feathertop aristida	
Poaceae	<i>Aristida platychaeta</i>	Curled wiregrass	
Poaceae	<i>Aristida ramosa</i>	Wire grass	
Poaceae	<i>Austrostipa verticillata</i>	Slender bamboo grass	
Poaceae	<i>Bothriochloa bladhii</i>	Forest bluegrass	
Poaceae	<i>Bothriochloa decipiens</i>	Pitted bluegrass	



Family name	Scientific name	Common name	Notes
Poaceae	<i>Chloris divaricata</i>	Windmill chloris, slender chloris	
Poaceae	<i>Chloris ventricosa</i>	Tall chloris	
Poaceae	<i>Cymbopogon refractus</i>	Barbwire grass	
Poaceae	<i>Dichanthium sericeum</i>	Queensland blue grass	
Poaceae	<i>Digitaria breviglumis</i>	Finger grass	
Poaceae	<i>Enneapogon gracillis</i>	Slender bottlewashers	
Poaceae	<i>Enneapogon pallidus</i>	Pale bottlewasher	
Poaceae	<i>Enneapogon polyphyllus</i>	Limestone bottlewasher	
Poaceae	<i>Enteropogon ramosus</i>	Twirly windmill grass	
Poaceae	<i>Eragrostis alveiformis</i>	Granite lovegrass	
Poaceae	<i>Eragrostis brownii</i>	Browns lovegrass	
Poaceae	<i>Eragrostis elongata</i>	Clustered lovegrass	
Poaceae	<i>Eragrostis sororia</i>	Blue eragrostis	
Poaceae	<i>Eulalia aurea</i>	Silky brown top grass	
Poaceae	<i>Melinis repens</i>	Red natal	Non-native
Poaceae	<i>Panicum decompositum</i>	Hairy panic	
Poaceae	<i>Panicum effusum</i>	Inquisitive grass	
Poaceae	<i>Pennisetum ciliare</i>	Buffel grass	Non-native
Poaceae	<i>Sporobolus caroli</i>	Fairy grass	
Poaceae	<i>Sporobolus creber</i>	Western rats tail grass	
Poaceae	<i>Themeda avenacea</i>	Wild oats grass	
Poaceae	<i>Themeda triandra</i>	Kangaroo grass	
Poaceae	<i>Thyridolepis mitchelliana</i>	Mulga mitchell grass	
Poaceae	<i>Triaphis mollis</i>	Purple plume grass	
Poaceae	<i>Urochloa mosambicensis</i>	Urochloa, sabi grass	
Proteaceae	<i>Grevillea striata</i>	Beefwood	
Proteaceae	<i>Hakea lorea</i>	Bootlace oak	
Rhamnaceae	<i>Alphitonia excelsa</i>	Red ash	
Rubiaceae	<i>Asperula conferta</i>	Common woodruff	
Rubiaceae	<i>Psydrax odorata</i>	Lamboto, sweet	

Family name	Scientific name	Common name	Notes
		susie	
Rubiaceae	<i>Psydrax oleifolia</i>	Canthium	
Rutaceae	<i>Flindersia australis</i>	Crows ash	
Rutaceae	<i>Flindersia collina</i>	Leopardwood	
Rutaceae	<i>Geijera parviflora</i>	Wilga	
Santalaceae	<i>Santalum lanceolatum</i>	Sandalwood	
Sapindaceae	<i>Alectryon diversifolius</i>	Scrub boonaree	
Sapindaceae	<i>Alectryon oleifolius</i>	Boonaree	
Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood	
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo	
Sapindaceae	<i>Dodonaea stenophylla</i>	Narrow leaf hopbush	
Sapindaceae	<i>Dodonaea triangularis</i>	Fan hopbush	
Sapindaceae	<i>Dodonaea viscosa</i>	Sticky hopbush	
Solanaceae	<i>Solanum esuriale</i>	Brown potato bush	
Solanaceae	<i>Solanum nigrum</i>	Black nightshade	Non-native
Sterculiaceae	<i>Brachychiton populneus</i>	Kurrajong	NC Act Type A Species
Sterculiaceae	<i>Keraudrenia collina</i>	Keraudrenia	
Tiliaceae	<i>Grewia latifolia</i>	Dysentery plant	
Verbenaceae	<i>Stachytarpheta jamaicensis</i>	Blue snakeweed	Non-native
Verbenaceae	<i>Verbena officinalis</i>	Common verbena, native verbena	
Verbenaceae	<i>Verbena tenuisecta</i>	Mayne's curse	Non-native

## Appendix B

### Incidental fauna recorded within the proposed development areas on Lot 6 on CP908635

Scientific name	Common name
<b>Birds</b>	
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped thornbill
<i>Acanthiza reguloides</i>	Buff-rumped thornbill
<i>Anthus australis</i>	Australasian pipit
<i>Aquila audax</i>	Wedge-tailed eagle
<i>Cacatua galerita</i>	Sulphur-crested cockatoo
<i>Colluricincla harmonica</i>	Grey-shrike thrush
<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike
<i>Corvus coronoides</i>	Australian raven
<i>Corvus orru</i>	Torresian crow
<i>Coturnix pectoralis</i>	Stubble quail
<i>Coturnix ypsilophora</i>	Brown quail
<i>Cracticus nigrogularis</i>	Pied butcherbird
<i>Cracticus torquatus</i>	Grey butcherbird
<i>Dacelo novaeguineae</i>	Laughing kookaburra
<i>Dicaeum hirundinaceum</i>	Mistletoebird
<i>Elanus axillaris</i>	Black-shouldered kite
<i>Eolophus rosiecapilla</i>	Galah
<i>Falco berigora</i>	Brown falcon
<i>Falco cenchroides</i>	Nankeen kestrel
<i>Falco subniger</i>	Black falcon
<i>Geopelia placida</i>	Peaceful dove
<i>Gerygone albogularis</i>	White-throated gerygone
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Gymnorhina tibicen</i>	Australian magpie

Scientific name	Common name
<i>Lichenostomus leucotis</i>	White-eared honeyeater
<i>Lichmera indistincta</i>	Brown honeyeater
<i>Malurus melanocephalus</i>	Red-backed fairy wren
<i>Manorina melanocephala</i>	Noisy miner
<i>Megalurus timoriensis</i>	Tawny grassbird
<i>Melithreptus albogularis</i>	White-throated honeyeater
<i>Myiagra rubecula</i>	Leaden flycatcher
<i>Nymphicus hollandicu</i>	Cockatiel
<i>Ocyphaps lophotes</i>	Crested pigeon
<i>Pachycephala rufiventris</i>	Rufous whistler
<i>Pardalotus striatus</i>	Striated pardalote
<i>Phalacrocorax varius</i>	Pied cormorant
<i>Philemon citreogularis</i>	Little friarbird
<i>Philemon corniculatus</i>	Noisy friarbird
<i>Platycercus adscitus</i>	Pale-headed rosella
<i>Rhipidura fuliginosa</i>	Grey fantail
<i>Rhipidura leucophrys</i>	Willie wagtail
<i>Smicrornis brevirostris</i>	Weebill
<i>Strepera graculina</i>	Pied currawong
<i>Taeniopygia bichenovii</i>	Double-barred finch
<i>Threskiornis molucca</i>	Australian white ibis
<i>Trichoglossus haematodus</i>	Rainbow lorikeet
<i>Zosterops lateralis</i>	Silvereeye
<b>Reptiles</b>	
<i>Carlia vivax</i>	Rainbow skink
<i>Cryptoblepharus vigatus</i>	Fence skink
<i>Eulamprus martini</i>	Skink
<b>Mammals</b>	

Scientific name	Common name
<i>Oryctolagus cuniculus</i>	European rabbit*
<i>Tachyglossus aculeatus</i>	Short-beaked echidna^ (diggings)
<i>Trichosurus vulpecula</i>	Brush-tailed possum (scats)

**Table notes:**      \*Declared 'Class 2 Pest' under the *Land Protection (Pest and Stock Route Management) Act 2002*  
                              ^'Special Least Concern' species under the *Nature Conservation Act 1992*



## Appendix C – Type A assessment

### Glossary of terms

Term	Definition
Translocation	The act of translocation is considered to be the deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to a location in the wild, including existing or new sites or those where the taxon is now locally extinct
Relocation	The deliberate transfer of plants or regenerative plant material from an ex situ collection or natural population to another locations. The relocation methodology will be primarily focused around the transplantation of seedlings or mature plants



# 1 Background

## 1.1 Project description

Santos Ltd (Santos) has commissioned Aurecon Australia Pty Ltd (Aurecon) to undertake ecological investigations of proposed areas of development for the Fairview gas fields.

Aurecon has also been engaged to assess the relocation potential of a range of Type A Restricted Plant species (Type A species) protected under the provisions of the *Nature Conservation Act 1992* (NC Act), in accordance with the *GLNG Upstream Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields* (The Salvage Management Plan) (Santos, 2011).

The Fairview gas fields are centred around the Injune area and are characterised by elevated sandstone ranges including the Carnarvon and Expedition Ranges and part of the Mount Hutton and Kongabula Ranges. The Dawson River and other smaller watercourses drain this area and the vegetation is dominated by Eucalyptus and White Cypress Pine woodland, Brigalow and Semi-evergreen Vine Thicket (Eddie, 2007).

Much of this area has been subjected to cattle grazing and other agricultural practices as well as previous development associated with the gas fields. However, a range of Type A Restricted plant species persist throughout both the disturbed and intact environments within the Fairview gas fields. The Salvage Management Plan provides a list of Type A species likely to be encountered within the GLNG Upstream gas fields (Refer Section 2 of The Salvage Management Plan). Common Type A species recorded within the Fairview gas fields include Bottle trees (*Brachychiton rupestris*, *Brachychiton populneus* and *Brachychiton australis*) Epiphytic orchids (*Cymbidium* species), and Grasstrees (*Xanthorrhoea* species).

This report is specific to the proposed development area labelled as 'Area A' on lot 6CP908635 in Figure 1.1 of the memo.

## 1.2 Purpose of this report

The purpose of this report is to provide an assessment of the relocation potential of Type A species located within Area A on lot 6CP908635 (herein referred to as the 'proposed development area') (Figure 1.1 of the memo). This assessment, and the proposed management measures, has been undertaken in accordance with The Salvage Management Plan. This report does not make any recommendation regarding the development in relation to any Santos environmental authorities or other approvals.



## 2 Methodology

The Type A species relocation assessments were undertaken in parallel to the ecological assessment of the proposed development area. These assessments were undertaken to determine the number of existing Type A species present within the development area, and their suitability for relocation from an ecological perspective. Safety, site accessibility and equipment availability/capacity were not considered as part of this assessment. Prior to making a decision to relocate an individual Type A specimen, field representatives are required to undertake a risk assessment in accordance with the Santos Environment Health Safety Management System (EHSMS) to determine whether it is safe to proceed with the proposed relocation.

GIS environmental layers showing the location of previously identified Type A species and high resolution aerial photography were uploaded onto a toughbook (C5 mobile clinical assistant CFT-001 – Motion computing), with an integrated GPS used to capture individual specimens for assessment. Handheld Garmin GPS units (GPS map 76) were also used during the field investigations. It should be noted that while efforts were made to ensure the GPS coordinates provided in this report are accurate, a margin of error approximately +/- 15 m is expected due to the limitations of the devices used and the recording environment.

Each individual specimen was logged and its GPS coordinates recorded using the toughbook. An assessment of the relocation potential of each specimen was undertaken based on likelihood of survival. Measurements were recorded for each relocatable specimen (i.e. height, canopy width and diameter at breast height) and specific relocation management requirements were recorded for each individual specimen.





## 3 Results

### 3.1 Type A species within Area A

The following sections outline the specific management requirements for each Type A species identified within the proposed development area. It is noted that some of the individuals located within the development area during these investigations were determined to **not** be suitable for relocation.

Two (2) species were recorded within the proposed development area during these assessments:

- *Brachychiton populneus* (Kurrajong)
- *Brachychiton rupestris* (Narrow-leaved Bottle Tree)

The location of the Type A species is provided in Figure 1-2 of the memo. The morphometrics, condition assessment and management measures relevant to the relocation of each individual is provided in the table below.

A photographic record of each individual plant is provided where available in following sections (Photo 3.1 – 3.6). Photographic records are a required as part of the *GLNG Upstream Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields* (Santos, 2011) (refer to Section 3.2.2 of the Plan).

### 3.2 General management requirements

Prior to relocating an individual Type A specimen, a field representative is required to undertake a risk assessment in accordance with the Santos Environment Health Safety Management System (EHSMS) to determine whether it is safe to proceed with the proposed relocation.

The *GLNG Upstream Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields* (Santos, 2011) outlines selected methods of obtaining plants for translocation/relocation, general standards and management measures pertaining to the translocation and relocation and of Type A species. All relocation and translocation activities are to be undertaken in accordance with the Salvage Management Plan.

ID	Species	GPS ID/ Coordinate		Photo No	Comment	Is plant salvageable?	If not, provide reason	Management requirements	Measurements				Significant habitat value
		Easting	Northing			(Yes/No)	(Disease, damaged, unlikely to survive due to poor health, other - provide comments)	(e.g. remove % foliage, maintain orientation, reduce number of stems etc.)	Tree height (m)	Tree width (m) (including foliage)	Root ball width (m)	Root ball depth (m)	(Nests, hollows etc)
1489	<i>Brachychiton populneus</i>	695976	7163712	N/A		Yes		Remove 70% foliage, maintain orientation	12.0	9.0	1.7	1	
1492	<i>Brachychiton populneus</i>	695985	7163465	N/A	insect attack evident on trunk - clear exudate	No	Damaged due to insect attack	Remove 70% foliage, maintain orientation	10.0	7.0	1.6	1	
1493	<i>Brachychiton populneus</i>	695995	7163476	N/A	insect attack - yellow exudate, holes in bark	No	Damaged due to insect attack	Remove 70% foliage, maintain orientation	9.0	8.0	1.5	1	
3449	<i>Brachychiton populneus</i>	695985	7163508	N/A	juvenile	Yes		Remove 70% foliage, maintain orientation	0.4	0.5	0.5	1	
4975	<i>Brachychiton populneus</i>	696050	7163659	N/A	2 plants 5 stems total	Yes		Remove 70% foliage, maintain orientation	3.0	1.5	1.7	1	
4976	<i>Brachychiton populneus</i>	696086	7163700	N/A	insect attack - clear exudate, holes in trunk	No	Damaged due to insect attack	Remove 70% foliage, maintain orientation	10.0	7.0	1.4	1	
4977	<i>Brachychiton populneus</i>	696107	7163687	3.1	3 plants 5 stems	Yes		Remove 70% foliage, maintain orientation	3.0	2.0	1.7	1	
4978	<i>Brachychiton populneus</i>	696132	7163703	3.2	<i>Brachychiton rupestris</i> hybrid	Yes		Remove 70% foliage, maintain orientation	17.0	10.0	1.7	1	
4979	<i>Brachychiton populneus</i>	696071	7163697	3.3		Yes		Remove 70% foliage, maintain orientation	7.0	8.0	1.6	1	
4980	<i>Brachychiton populneus</i>	696149	7163468	3.4		Yes		Remove 70% foliage, maintain orientation	9.0	3.0	1.2	1	
5011	<i>Brachychiton populneus</i>	696186	7163698	3.5		Yes		Remove 70% foliage, maintain orientation	1.6	0.5	0.5	1	
5010	<i>Brachychiton rupestris</i>	696188	7163701	3.6	growing amongst rocks	Yes		Remove 70% foliage, maintain orientation	0.8	0.2	0.5	1	



Photo 3.1 *Brachychiton populneus* (Kurrajong)  
Plant ID 4977



Photo 3.3 *Brachychiton populneus*  
Plant ID 4979



Photo 3.5 *Brachychiton populneus* (juvenile)  
Plant ID 5011



Photo 3.2 *Brachychiton populneus*  
Plant ID 4978



Photo 3.4 *Brachychiton populneus*  
Plant ID 4980



Photo 3.6 *Brachychiton rupestris* (juvenile)  
Plant ID 5010



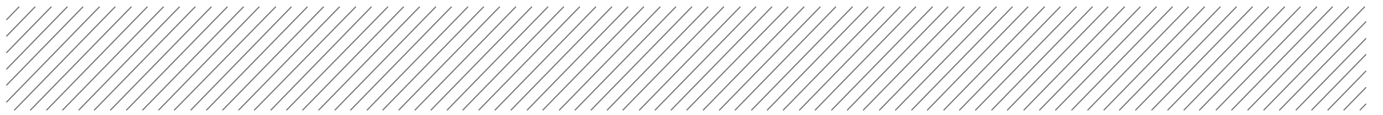
## 4 Conclusion

A total of 12 individual Type A plant specimens were recorded within the proposed 'Area A' development area. This included 9 mature *Brachychiton populneus* (Kurrajong), 2 juvenile *B. populneus* and 1 juvenile *Brachychiton rupestris* (Narrow-leaved Bottle Tree).

On the basis of this ecological assessment, three *B. populneus* Type A specimens found within the proposed development area were determined to be unsuitable for relocation. Their unique identifying numbers are 1492, 1493 and 4976. All three specimens showed trunk damage presumably due to insect attack, which presented as a clear or yellow exudate on the trunk or limbs, with numerous holes in the bark.

Prior to relocating any Type A specimen, a field representative is required to undertake a risk assessment in accordance with the Santos Environment Health Safety Management System (EHSMS) to determine whether it is safe to proceed with the proposed relocation.

All relocation activities are to be undertaken in accordance with the *GLNG Upstream Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields* (Santos Ltd, 2011).



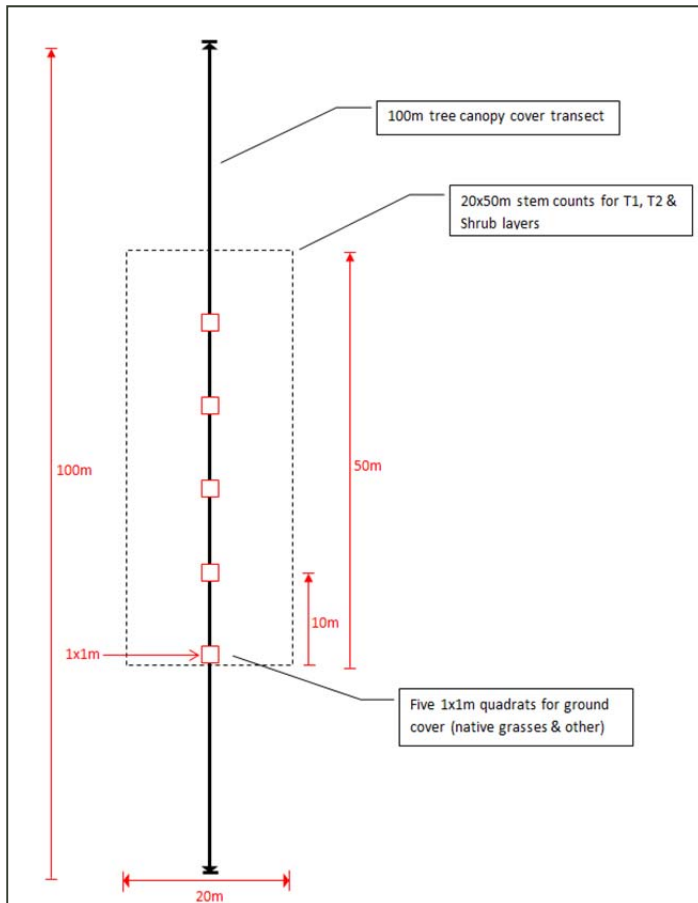
## 5 References

Eddie, C (2007) *Field Guide to Trees and Shrubs of Eastern Queensland Oil and Gas Fields*, First Edition, Santos Ltd, Adelaide.

Santos Ltd (2011) GLNG Upstream Type A Restricted Plant Species Salvage Management Plan for the Coal Seam Gas Fields, Santos Ltd, Brisbane.

## Appendix D Detailed vegetation survey

This appendix provides the ground cover, canopy cover and stem count data collected during the field investigations throughout the proposed development areas which is referenced throughout the ecological assessment. The diagram below shows the transect arrangement in the field.



**Mapped RE 11.10.1/11.10.13a within Area A**

**Ground cover data**

The following values indicate the percentage of each ground cover category for five (5) 1 m by 1 m quadrats. The average ground cover for each category is also provided in the 'Averages' column.

**Ground cover data**

Groundcover	Q 1 (%)	Q 2 (%)	Q 3 (%)	Q 4 (%)	Q 5 (%)	Averages (%)
Native grasses	15	3	35	25	15	18.6
Native forbs and herbs		2	5		5	2.4
Non-native grasses						
Non-native forbs and herbs						
Shrubs						
Bare ground	30	3		2	3	7.6
Rock	7	15	20	10	15	13.4
Leaf litter	40	72	30	58	47	49.4
Woody debris	8	5	10	5	5	6.6

**Stem count data**

The following table is the stem count data collected during the field investigation for the Canopy (T1), Sub-canopy (T2) and Shrub layer (S1). The heights for each of the stratum are also defined below.

Transect	Stem counts per stratum per 50 x 20 m plots		
	T1 (12-17 m)	T2 (6-10 m)	S1 (1-5 m)
0-10 m	0	13	6
10- 20 m	5	3	3
20- 30 m	1	7	2
30- 40 m	4	3	4
40- 50 m	4	3	2
<b>Totals</b>	14	29	17

**Stems per hectare calculations**

- **T1** (12-17 m) – 140 stems per hectare
- **T2** (6-10 m) – 290 stems per hectare
- **S1** (1-5 m) – 170 stems per hectare

**Foliage projective cover data**

The total Foliage Projective Cover (FPC) for the T1 and T2 canopies along two (2) 50 m transects, expressed as a percentage is:

- T1 (12-17 m) – 58.2% FPC
- T2 (6-10 m) – 30.6% FPC

The canopy transect data collected during the field investigation is provided in the following table.

Stratum	Distance		Total (m)
	Start	End	
T1	3.5	23.9	20.4
	30.7	34.1	3.4
	47.1	58.5	11.4
	64.5	68.7	4.2
	70	75.5	5.5
	81.6	88.6	7
	91.7	98	6.3
<b>TOTAL T1</b>			<b>58.2</b>
T2	5.7	7.9	2.2
	8.7	10.5	1.8
	25.4	31.7	6.3
	32.9	43.4	10.5
	49	52	3
	54	56.8	2.8
	57.9	59.4	1.5
	68	70.5	2.5
<b>TOTAL T2</b>			<b>30.6</b>
<b>Totals</b>			
<b>Total T1</b>			<b>58.2</b>
<b>Total T2</b>			<b>30.6</b>