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Project: Roma Ecological Assessment – Addendum to Lot 94 on WV456 & Lot 96 on WV457 Reports				Reference: 221708	
To:	Copy:	Circulate:	Name:	Organisation:	Location/Facsimile:
✓			Paul Wybrew	Santos Ltd	32 Turbot St, Brisbane
From: Aurecon C/o Vanessa Boettcher				Date: 31 August 2011	
				Total pages: 8	

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Subject: Geotechnical Survey Locations & Corridors – Addendum to Lots 94 on WV456 & Lot 96 on WV457

Dear Mr Wybrew

This memorandum relates to the ground-truthing of the proposed development areas shown in Figure 1.1 (page 5). This memorandum documents the results of ecological investigations of three (3) geotechnical survey locations (ie CPU3-RM01, CPU3-RM02 and CPU3-RM03), Corridors R1 and R78, and the connecting corridor between the Roma Permanent Camp and Corridor R78, all of which are located on Lots 94 on WV456 & Lot 96 on WV457. These ecological investigations were undertaken on 19 July 2011 and 14 August 2011 by three (3) Aurecon ecologists (Sarah Glauert, Hayley Poole and Cassandra Arkinstall).

Reports specific to additional proposed development areas within the aforementioned Lots have been prepared and submitted to Santos previously, with the following document reference numbers:

- HCS-02 Ecological Assessment Report – 0020-GLNG-4-1.3-0022
- Stakeout Locations Ecological Assessment Report – 0020-GLNG-4-1.3-0082

This memorandum should be treated as an addendum to the reports listed above. This memorandum is specific to the ecology of the section of the proposed development areas shown in Figure 1.1. For additional information relative to additional proposed development areas within/adjacent to these Lots, please refer to the appropriate Lot-specific report, where this information has been captured.

1. Ecological assessment

General

The three (3) corridors assessed during these field investigations (ie R1, R78 and the corridor connecting R78 and the Roma Permanent Camp) were all located on Lot 94 on WV456 (Figure 1.1).

Three (3) geotechnical survey locations (including a 50 m buffer) were assessed as part of these ecological investigations (Figure 1.1), namely:

- CPU3-RM01 – Lot 96 on WV457
- CPU3-RM02 – Lot 94 on WV456
- CPU3-RM02 – Lot 94 on WV456

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The proposed development areas are located within a highly modified environment resulting from historical vegetation clearing, current agricultural practices (including stock grazing) and existing developments (ie camps and laydown yards). The areas have been previously cleared of vegetation, and are dominated by *Pennisetum ciliare* (Buffel Grass). Woody regrowth occurs within the buffer zones of CPU3-RM01 and CPU3-RM03; however no canopy species were recorded at any of the geotechnical survey locations.

The majority of the proposed development area is mapped as non-remnant vegetation (Department of Environment and Resource Management [DERM] certified Regional Ecosystem [RE] mapping). One small section of remnant vegetation is mapped to the south of Corridor R1, associated with Blyth Creek. This vegetation is mapped as 'no concern at present' RE 11.10.9 (Biodiversity Status under the provisions of the *Vegetation Management Act 1999* [VM Act]). Field investigations determined the RE mapping to be incorrect, as discussed in the 'Floristics' section below.

No Environmentally Sensitive Areas (ESAs) (or associated buffers) are mapped within the proposed geotechnical survey locations. The nearest mapped ESA is located approximately 550 m to the east of CPU3-RM03.

Two (2) low-order mapped watercourses (DERM) occur within the proposed development area, intersecting CPU3-RM01 (stream order 1) and Corridor R1 (stream order 1) (Figure 1.1). The southern portion of Corridor R1 is directly adjacent to Blyth Creek (stream order 5). The proposed development area extends into the riparian zone of this creek.

Floristics

Geotechnical survey locations

The sub canopy and shrub layer are considered very sparse (ie each accounting for less than 5% cover of the geotechnical survey locations). Within the sub-canopy *Eucalyptus populnea* (Poplar Box), *Geijera parviflora* (Wilga) and *Acacia excelsa* (Ironwood) are locally dominant. *Geijera parviflora* dominates the shrub layer, with other species recorded including *Eremophila mitchellii* (False Sandalwood), *Owenia acidula* (Emu Apple), *Allocasuarina luehmannii* (Bull Oak) and *Atalaya hemiglauc*a (Whitewood).

The ground stratum contains the greatest species diversity and abundance, and is considered dense (ie 80-90% cover), with *P. ciliare* occurring as the dominant species at all three (3) geotechnical survey locations. Other species present within the ground layer include *Chloris pectinata* (Comb Chloris), *Chloris gayana* (Rhodes Grass), *Verbena tenuisecta* (Mayne's Curse) and *Themeda triandra* (Kangaroo Grass).

No species of conservation significance (ie endangered, vulnerable or near threatened [EVNT] species protected under the provisions of the *Nature Conservation Act 1992* [NC Act] and/or the *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act]) were recorded within the geotechnical survey locations. Furthermore, no species of harvestable importance (ie Type A restricted plants protected under the provisions of the NC Act) were identified within the geotechnical survey locations during field investigations.

A list of flora species recorded within the geotechnical survey locations during field investigations is provided in the Attachment on page 6.

Corridors R1, R78 and Corridor Connecting R78 and Roma Permanent Camp

The ground layer within the proposed corridors is dominated by exotic pasture grasses and weeds. *Pennisetum ciliare* dominates this stratum, whilst additional species present at lower densities include *Themeda quadrivalvis* (Grader Grass), *Heteropogon contortus* (Black Spear Grass) and *Melinis repens* (Red Natal Grass).

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The remnant vegetation along Blyth Creek is mapped as RE 11.10.9. A brief description of this RE type is provided below in Table 1.1.

Table 1.1 RE descriptions of mapped remnant vegetation within proposed pipeline corridor R1

RE Type	RE Description (DERM 2009)	Biodiversity Status (VM Act)
11.10.9	<i>Callitris glaucophylla</i> woodland to open-forest often associated with <i>Eucalyptus melanophloia</i> in the tree canopy and a sparse ground layer. Various other tree species may be present including <i>Corymbia clarksoniana</i> , <i>Eucalyptus populnea</i> , <i>C. tessellaris</i> , <i>E. chloroclada</i> and <i>Angophora leiocarpa</i> which may form a mono-specific open-woodland in places	No concern at present

The vegetation community observed along the watercourse was not consistent with the DERM RE certified mapping. The geology of the area is Quaternary alluvium associated with the watercourse, and is therefore classified as Landzone 3 of the RE classification system (Sattler & Williams 1999).

Along the upper banks of the watercourse *Eucalyptus populnea* (Poplar Box) or *Eucalyptus tereticornis* (Queensland Blue Gum) occur as locally dominant canopy species, with other species including *Callitris glaucophylla* (White Cypress Pine), *Angophora floribunda* (Rough-barked Apple) and *Allocasuarina luehmannii* (Bull Oak). The height range of the canopy layer is 16-26 m, with an approximate crown cover percentage of 60%, and is therefore consistent with an open-forest structural formation (Neldner *et al.* 2005). The vegetation community is analogous to a heterogeneous polygon of RE 11.3.2/11.3.4 ('of concern' Biodiversity Status, VM Act).

Four (4) Type A restricted plants, *Brachychiton populneus* (Kurrajong), were detected within the proposed development area (refer to Figure 1.1 and Table 1.2).

Table 1.2 Location of NC Act Type A Restricted Plants within the proposed development area

Species	Easting (GDA 94, Zone 55J)	Northing (GDA 94, Zone 55J)
<i>Brachychiton populneus</i>	702965	7071664
<i>Brachychiton populneus</i> (x2)	703113	7071216
<i>Brachychiton populneus</i>	703107	7071210

Habitat values

Ten (10) incidental fauna species were recorded within the proposed development area. The species recorded during field investigations were: Galah (*Eolophus roseicapilla*), Pale-headed Rosella (*Platycercus adscitus*), Torresian Crow (*Corvus orru*), Sulphur-crested Cockatoo (*Cacatua galerita*), Weebill (*Smicrornis brevirostris*), Noisy Miner (*Manorina melanocephala*), Australian Magpie (*Cracticus tibicen*), Crested Pigeon (*Ocyphaps lophotes*), Striated Pardalote (*Pardalotus striatus*), and Red-winged Parrot (*Aprosmictus erythropterus*).

No fauna species of conservation significance (ie EVNT species protected under the provisions of the NC Act and/or the EPBC Act) were recorded during field investigations.

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The proposed development area has been extensively disturbed as a result of historical clearing, stock grazing, the invasion of exotic pasture species and current developments associated with laydown areas and camp areas. Habitat features associated with the proposed development are therefore typically limited to vegetation associated with the watercourses. Although the riparian vegetation has been historically cleared in most locations within the proposed development area, the remaining riparian vegetation/regrowth is likely to provide habitat for a range of avian fauna, reptiles and small arboreal mammals (including marsupials). The habitat value of the riparian vegetation within the proposed development area is considered to be moderate overall.

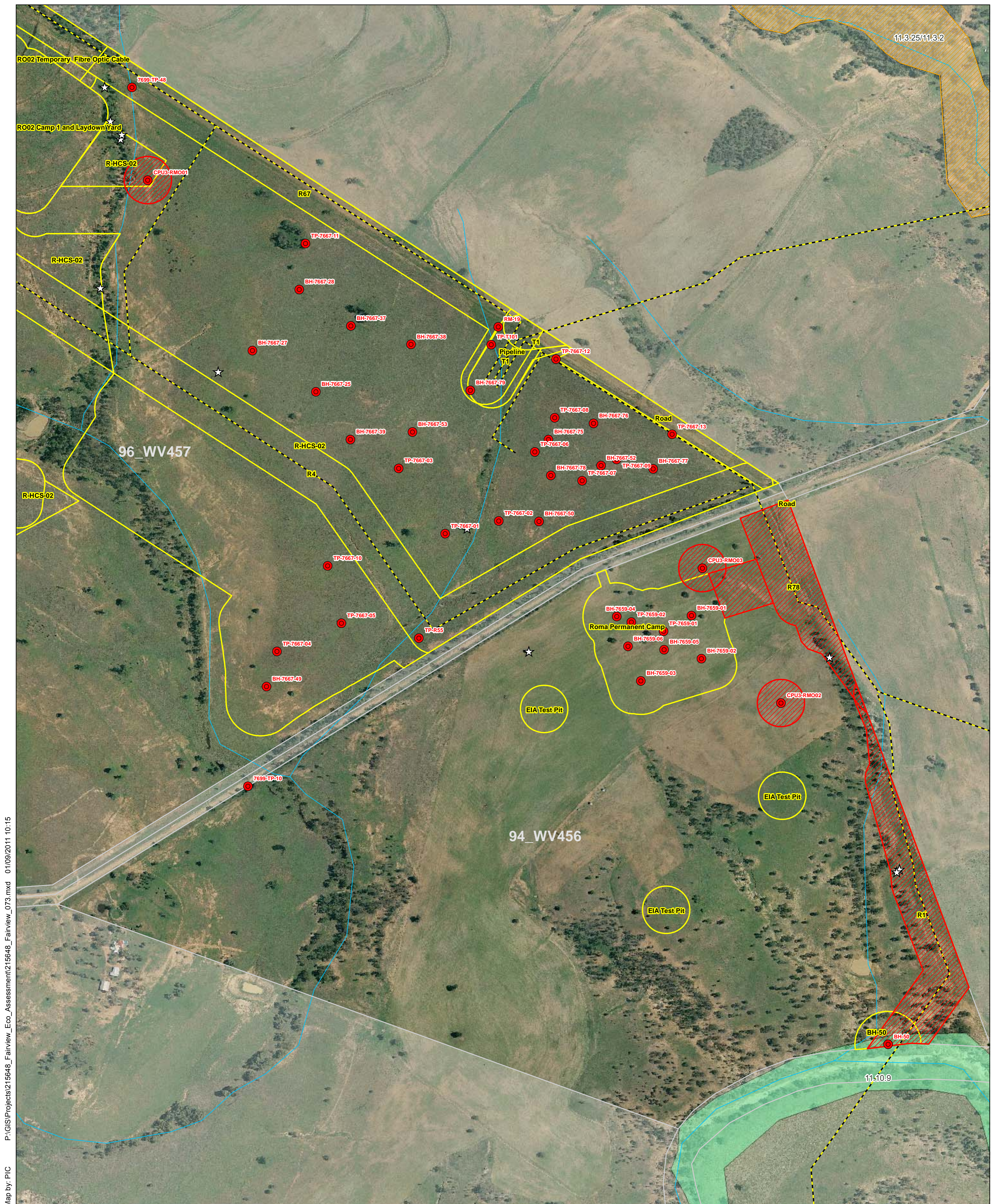
Within the cleared areas, habitat values were typically limited to dense groundcover vegetation (ie grassy tussocks) and woody debris (ie fallen/felled timber). As such, the habitat value of the cleared areas is considered to be low, overall.

Species utilising resources within the proposed development areas are most likely to be limited to common, generalist species that are able to adapt to significant habitat disturbances (ie House mouse [*Mus musculus*], common macropods). Common birds of prey (eg Nankeen Kestrel [*Falco cenchroides*], Black Kite [*Milvus migrans*]) are also expected to utilise this site and the surrounding areas for foraging purposes.

References

Neldner, VJ, Wilson, BA, Thompson, EJ and Dillewaard, HA (2005) Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1. Updated September 2005. Queensland Herbarium, Environmental Protection Agency, Brisbane. 128 pp.

Sattler, PS and Williams, RD (eds) (1999) The Conservation Status is Queensland Bioregional Ecosystems. Environmental Protection Agency, Brisbane.



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 Map by: PIC

Legend

	Additional Areas Assessed		ESA Mapping (Including Buffer Areas)		Regional Ecosystem
	EVNT and Type A Species		Category A		Endangered - Dominant
	Corridors - Ground Truth		Category B		Endangered - Sub-dominant
	Geotech Borehole		Category C		Of Concern - Dominant
	Cadastre				Of Concern - Sub-dominant
	Watercourse				Least Concern

Source:
 Cadastre: DERM, 2011.
 Regional Ecosystems: Version 6, The State of Queensland
 (Department of Environment and Resource Management),
 Nov 2009.



A1 scale: 1:4,000
 0 50 100 200 300 Meters

Date: 01/09/2011 Version: 1 Job No: 215648
 Coordinate system: GDA_1994_MGA_Zone_55

Santos Upstream Ecological Assessment

Figure 1-1: Location of Additional Investigation Areas

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Botanical species list

Family Name	Scientific Name	Common Name	Notes
Adiantaceae	<i>Cheilanthes sieberi</i>	Mulga Fern	
Amaranthaceae	<i>Alternanthera dentata</i>	Joy Weed	
Amaranthaceae	<i>Alternanthera nodiflora</i>	Common Joy Weed	
Apiaceae	<i>Hydrocotyle laxiflora</i>	Pennywort	
Apocynaceae	<i>Alstonia constricta</i>	Bitter Bark	
Asteraceae	<i>Bidens pilosa</i>	Cobblers Pegs	
Asteraceae	<i>Brachycome dentata</i>	Lobe-seed Daisy	
Asteraceae	<i>Bracteantha bracteata</i>	Everlasting Daisy	
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>Chrysocephalum apiculatum</i>	Yellow Buttons	
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle, Black Thistle	
Asteraceae	<i>Conyza bonariensis</i>	Fleabane	
Asteraceae	<i>Podolepis jaceoides</i>	Showy Copper Wire Daisy	
Asteraceae	<i>Pterocaulon sphacelatum</i>	Apple Bush	
Asteraceae	<i>Sonchus oleraceus</i>	Sow Thistle	
Asteraceae	<i>Tagetes minuta</i>	Stinking Rodger	
Asteraceae	<i>Xanthium occidentale</i>	Noogoora Burr	
Brassicaceae	<i>Lepidium sagittulatum</i>	Pepper Cress	
Brassicaceae	<i>Sisymbrium thellungii</i>	African Turnip Weed	
Cactaceae	<i>Opuntia tomentosa</i>	Velvety Tree Pear	LP Act Class 2 Weed
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	
Capparaceae	<i>Capparis loranthifolia</i>	Nipan, Wait a while	
Casuarinaceae	<i>Allocasuarina luehmannii</i>	Bull Oak	
Chenopodiaceae	<i>Chenopodium carinatum</i>	Keeled Goosefoot	
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaf Bluebush	
Chenopodiaceae	<i>Sclerolaena birchii</i>	Galvanised Burr	
Chenopodiaceae	<i>Sclerolaena muricata</i>	Black Roly-poly	
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine	
Cyperaceae	<i>Cyperus difformis</i>	Dirty Dora	
Cyperaceae	<i>Fimbristylis dichotoma</i>	Fimbristylis	
Euphorbiaceae	<i>Acalypha sp.</i>	Turkey Bush	
Fabaceae - Faboideae	<i>Crotalaria dissitiflora</i>	Grey Rattlepod	
Fabaceae - Faboideae	<i>Glycine tomentella</i>	Hairy Glycine	
Fabaceae - Faboideae	<i>Medicago polymorpha</i>	Burr Medic	
Fabaceae - Mimosoideae	<i>Acacia excelsa</i>	Ironwood	
Goodeniaceae	<i>Goodenia glabra</i>	Smooth Goodenia	
Goodeniaceae	<i>Goodenia rotundifolia</i>	Goodenia	
Juncaceae	<i>Juncus usitatus</i>	Juncus	

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Family Name	Scientific Name	Common Name	Notes
Lamiaceae	<i>Salvia reflexa</i>	Mint Bush	
Lomandraceae	<i>Lomandra multiflora</i>	Lomandra	
Malvaceae	<i>Malvastrum americanum</i>	Spiny Malvastrum	
Malvaceae	<i>Sida acuta</i>	Spiny-head Sida	
Malvaceae	<i>Sida spinosa</i>	Spiny Sida	
Malvaceae	<i>Sida subspicata</i>	Queensland Hemp	
Meliaceae	<i>Owenia acidula</i>	Emu Apple	
Myoporaceae	<i>Eremophila mitchellii</i>	False Sandalwood	
Myrsinaceae	<i>Anagallis arvensis</i>	Scarlet Pimpernel	
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	
Myrtaceae	<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	
Myrtaceae	<i>Eucalyptus populnea</i>	Poplar Box	
Myrtaceae	<i>Eucalyptus tereticornis</i>	Queensland Blue Gum	
Plantaginaceae	<i>Plantago cunninghamii</i>	Plantago	
Plantaginaceae	<i>Plantago lanceolata</i>	Common Plantain	
Poaceae	<i>Aristida calycina</i>	Dark Wiregrass	
Poaceae	<i>Aristida caput medusae</i>	Curly Head Wiregrass	
Poaceae	<i>Aristida jerichoensis</i>	Jericho Wiregrass	
Poaceae	<i>Austrostipa verticillata</i>	Slender Bamboo Grass	
Poaceae	<i>Capillipedium spicigerum</i>	Scented-top Grass	
Poaceae	<i>Chloris divaricata</i>	Windmill Chloris	
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	
Poaceae	<i>Chloris pectinata</i>	Comb Chloris	
Poaceae	<i>Chloris virgata</i>	Silky-topped Rhodes Grass	
Poaceae	<i>Cymbopogon refractus</i>	Barbed-wire Grass	
Poaceae	<i>Dichanthium sericeum</i>	Queensland Blue Grass	
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	
Poaceae	<i>Eragrostis sororia</i>	Blue Eragrostis	
Poaceae	<i>Heteropogon contortus</i>	Black Spear Grass	
Poaceae	<i>Melinis repens</i>	Red Natal	
Poaceae	<i>Panicum decompositum</i>	Hairy Panic	
Poaceae	<i>Panicum effusum</i>	Inquisitive Grass	
Poaceae	<i>Panicum laevinode</i>	Panic Grass	
Poaceae	<i>Panicum simile</i>	Two-coloured Panic	
Poaceae	<i>Pennisetum ciliare</i>	Buffel Grass	
Poaceae	<i>Sorghum halepense</i>	Johnson Grass	
Poaceae	<i>Sporobolus caroli</i>	Desert Sporobolus	
Poaceae	<i>Sporobolus creber</i>	Western Rat's-Tail Grass	
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass	
Poaceae	<i>Urochloa mosambicensis</i>	Urochloa	
Polygonaceae	<i>Emex australis</i>	Spiny Emex	
Portulacaceae	<i>Portulaca oleracea</i>	Pig Weed	
Portulacaceae	<i>Portulaca pilosa</i>	Hairy Pigweed	
Proteaceae	<i>Grevillea striata</i>	Beefwood	
Rubiaceae	<i>Psydrax odorata forma buxifolius</i>	Round Leaf Psydrax	
Rutaceae	<i>Citrus glauca</i>	Lime Bush	
Rutaceae	<i>Geijera parviflora</i>	Wilga	

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Family Name	Scientific Name	Common Name	Notes
Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood	
Scrophulariaceae	<i>Verbascum virgatum</i>	Twiggy Mullein	
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	
Sterculiaceae	<i>Brachychiton populneus</i>	Kurrajong	NC Act Type A Species
Verbenaceae	<i>Verbena bonariensis</i>	Bunchy Verbena, Purpletop Verbena	
Verbenaceae	<i>Verbena officinalis</i>	Common Verbena, Native Verbena	
Verbenaceae	<i>Verbena tenuisecta</i>	Mayne's Curse	

Notes:

¹ - Taxonomic classifications, nomenclature and naturalised status of species is derived from the Census of Queensland Flora 2010