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Document prepared by:

Aurecon Australia Pty Ltd
 ABN 54 005 139 873
 Level 14, 32 Turbot Street
 Brisbane QLD 4000
 Locked Bag 331
 Brisbane QLD 4001
 Australia

T +61 7 3173 8000
F +61 7 3173 8001
E brisbane@aurecongroup.com
W aurecongroup.com

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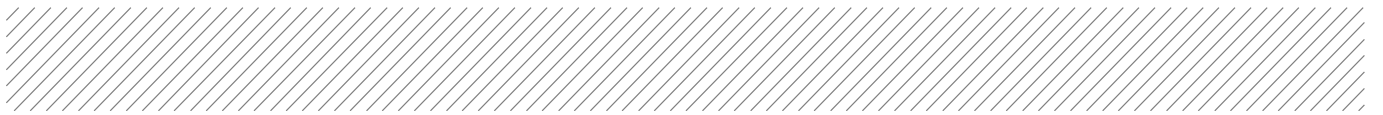
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Aurecon Australia Pty Ltd
ABN 54 005 139 873
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Brisbane QLD 4000
Locked Bag 331
Brisbane QLD 4001
Australia

T +61 7 3173 8000
F +61 7 3173 8001
E brisbane@aurecongroup.com
W aurecongroup.com



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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 Roma gas fields.

The Roma gas fields are located near the township of Roma and are characterised by undulating terrain with small elevated areas including the Thomby and Grafton Range. The dominant vegetation types within the Roma gas fields include Eucalypt and/or Brigalow woodlands, Blue grass or Mitchell grass downs, and smaller areas of White Cypress Pine and Mulga (Eddie 2007). The Roma gas fields are located within the Balonne River catchment.

Much of this area has been subject to cattle grazing and other agricultural practices, as well as previous development associated with the gas fields.

This report is specific to the proposed development areas listed below and shown in Figure 1.1:

- Pleasant Hills Flowline 32
- Geotechnical survey locations situated within the above corridor and shown in Figure 1.1
- The Mt Saltbush Road corridor occurring on Lot 5 WV434

These areas are collectively referred to as the 'proposed development area', and are located entirely within Lot 5 WV434. Note that the subject of this report is solely related to Lot 5 WV434. Where survey areas overlap additional properties, these sites will be further addressed in the report relevant to those properties/lots.

1.2 Purpose of report

The aim of this report is to provide an ecological assessment of the proposed development areas located on Lot 5 WV434 (Figure 1.1), and to identify areas and species of notable ecological or conservation value. This report does not make any recommendations regarding the development in relation to any Santos environmental authorities or other approvals.



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- Legend**
- Notable Species
 - Geotech Borehole Locations
 - Ground Truthed Areas
 - Drainage (100K)
 - ESA Category A
 - ESA Category B
 - ESA Category C
- Regional Ecosystem Mapping**
- Non-remnant / regrowth
 - Endangered - Sub-dominant
 - Endangered - Dominant
 - Of Concern - Sub-dominant
 - Of Concern - Dominant
 - Not Of Concern
 - Plantation forest
 - Water

Notes: Regional Ecosystem (RE) status depicted in this map are based on the vegetation management status of the RE as described in the Regional Ecosystem Description Database. The biodiversity status of the vegetation is not shown on this map.

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Santos Lot 5 on WV434



Figure 1.1 Overview of proposed corridors and geotechnical locations that were ground-truthed on Roma Lot 5 WV434

2 Methodology

2.1 Desktop methodology

Proposed development areas have been projected on a range of maps provided by Santos. These maps include Regional Ecosystem (RE) Mapping (version 6.0; Department of Environment and Resource Management [DERM]), Environmentally Sensitive Areas (ESA) mapping, drainage mapping and aerial photography. Where available ahead of time, these resources were reviewed to determine target areas for the field inspection. It is important to note that the RE classifications used in this report are based on the 'biodiversity status' of the vegetation and not the '*Vegetation Management Act 1999* (VM Act) status' of the vegetation.

2.2 Field methodology

The proposed development areas were assessed by three (3) Aurecon ecologists (Sarah Glauert, Sandra Walters and Hayley Poole) on 17 - 19 May 2011 and 19 July 2011. These assessments were to determine the existing vegetation communities and habitat value of the proposed clearing within the development areas as well as to verify the RE mapping as produced by DERM.

GIS environmental constraints layers (eg RE Mapping, ESA mapping etc) and high resolution aerial photography were uploaded onto a toughbook (C5 mobile clinical assistant CFT-001 – Motion computing), with an integrated GPS used to locate surveys areas. 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 co-ordinates 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.

The corridors were 100m wide and of varying lengths, and the circular well pad areas had a radius of 175 m. Geotechnical survey locations were also assessed as part of the survey areas (a 50m buffer zone around each survey location was assessed).

The ground-truthing of the proposed development areas included undertaking detailed flora species surveys including sampling of unknown flora, and recording all incidental fauna observations. All species known to be of conservation significance (such as endangered, vulnerable, near threatened or Type A species under the *Nature Conservation Act 1992* [NC Act] or endangered, vulnerable or rare species under the *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act]) were recorded using the toughbook.

A list of flora species observed in the proposed development areas has been included in **Appendix A**. Incidental fauna observations are provided in the relevant sections throughout this report.

3 Ecological assessment

3.1 Pleasant Hills 32 Flowline including Pleasant Hills 32

3.1.1 General

Pleasant Hills 32 Flowline and the associated well pad, Pleasant Hills 32, is located west of Mount Saltbush Road on Lot 5 WV434, as shown in Figure 3.1 and Figure 3.2.

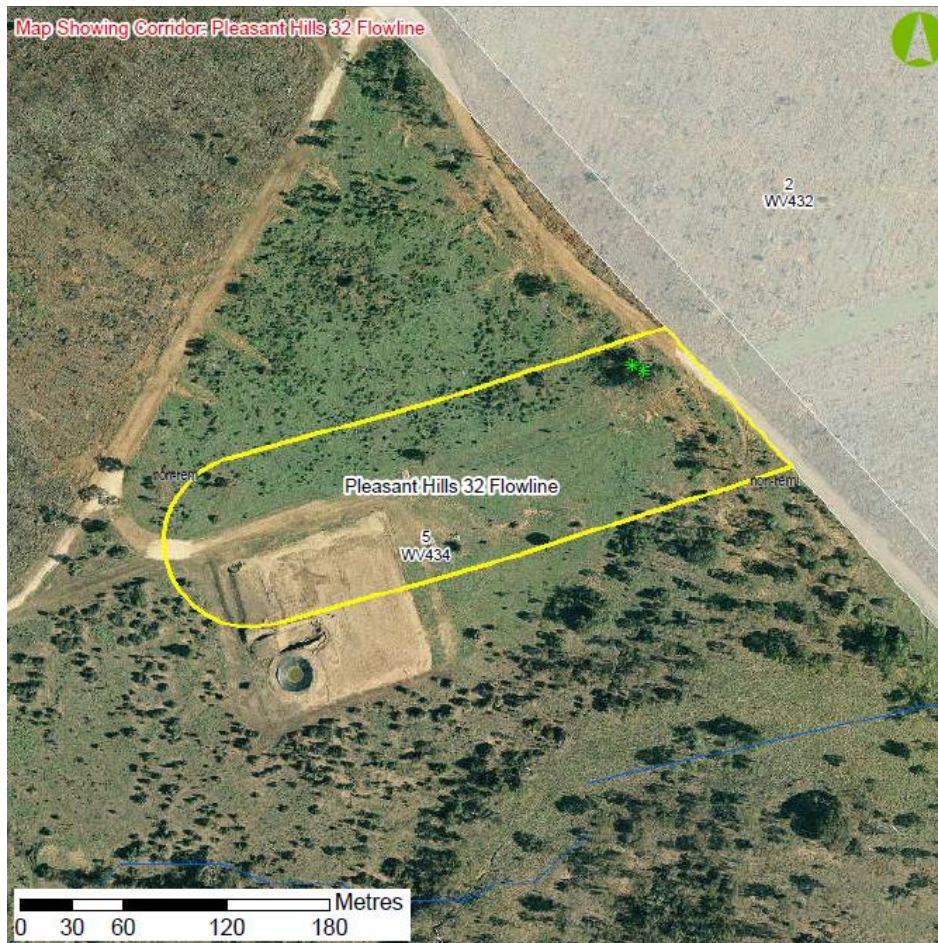


Figure 3.1 Aerial photograph of proposed corridor Pleasant Hills 32 Flowline with overlaid RE and ESA mapping

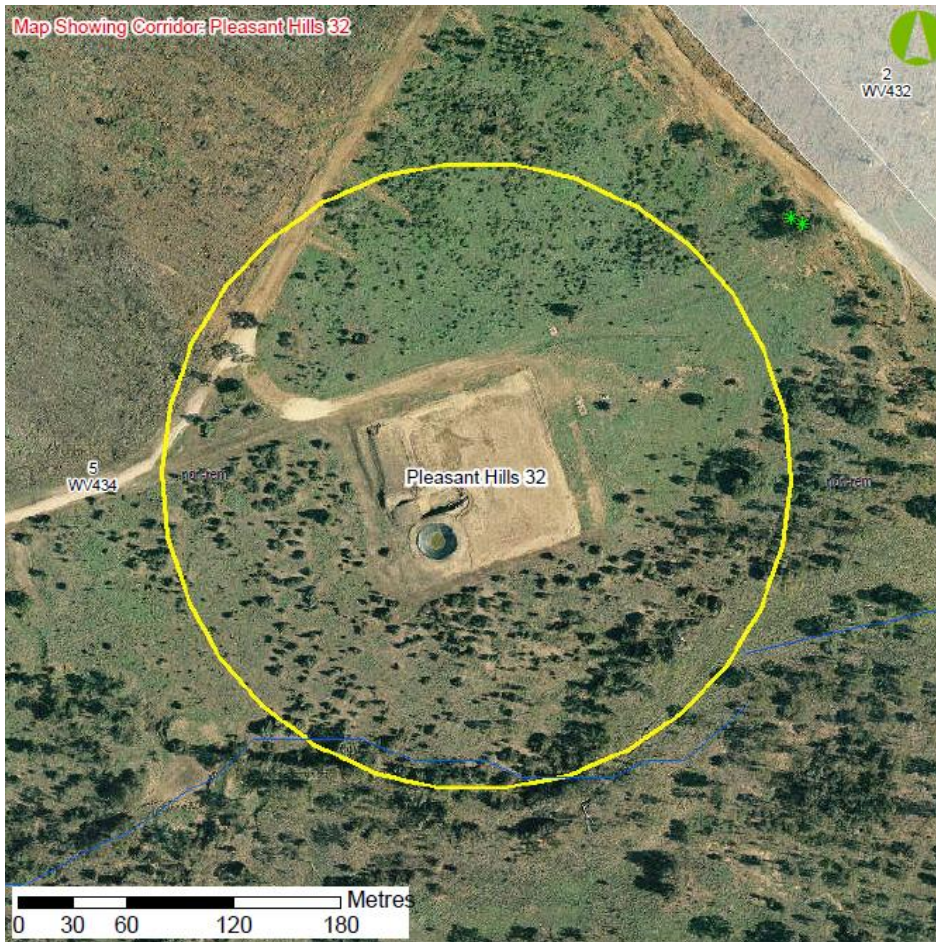


Figure 3.2 Aerial photograph of Pleasant Hills 32 with overlaid RE and ESA mapping

An access track enters the Pleasant Hills 32 site from the north west, which leads to the cleared area in the centre of the site which is approximately 100 x 100 m.

The entire proposed development area is mapped as non-remnant vegetation. Field investigation confirmed the vegetation mapping to be correct. The closest mapped remnant vegetation is more than 2 km from the development footprint.

There are no ESAs located within the Pleasant Hills 32 Flowline or the Pleasant Hills 32 site. The closest ESA is more than 1 km away.

One minor watercourse traverses the southern edge of the Pleasant Hills 32 site. This watercourse is classed as a stream order 1.

An example of the vegetation located in the Pleasant Hills 32 site is shown in Photo 3.1.



Photo 3.1 An example of the vegetation present on the Pleasant Hills 32 site.

3.1.2 Floristics

The proposed development area has been extensively cleared and is dominated by shrubby regrowth vegetation. Scattered shrubs included *Eucalyptus populnea* (Poplar Box), *Carissa ovata* (Current Bush), *Ventilago viminalis* (Vine Tree), *Acacia harpophylla* (Brigalow), *Apophyllum anomalum* (Warrior Bush), *Grevillea striata* (Beefwood) and *Hakea lorea* (Bootlace Oak). The ground layer is dominated by *Pennisetum ciliare* (Buffel Grass), with some isolated native grasses such as *Eragrostis brownii* (Browns Lovegrass) and *Austrostipa verticillata* (Slender Bamboo Grass).

Two (2) Type A restricted plants were identified within the Pleasant Hills 32 Flowline – a *Brachychiton rupestris* (Narrow Leaved Bottle Tree) and a *Brachychiton populneus* (Kurrajong). The location of these plants is recorded in Table 3.1.

Table 3.1 Location of Type A Restricted Plants (*Nature Conservation Act 1992*)

Species	Easting (GDA 94, Zone 55J)	Northing (GDA 94, Zone 55J)
<i>Brachychiton rupestris</i>	699680	7081240
<i>Brachychiton populneus</i>	699673	7081244

No other species of conservation significance under the EPBC or NC Act were present within the proposed development area.



3.1.3 Habitat value

The habitat value of the Pleasant Hills 32 Flowline and the Pleasant Hills 32 site was considered to be low. The area has been extensively cleared in the past, and is now dominated by exotic Buffel Grass and scattered regrowth vegetation. While the area could provide some habitat value for small ground-dwelling animals (such as lizards), the area is very exposed and has limited potential for nesting sites, food sourcing or shelter. A proportion of the Pleasant Hill 32 site has already been developed, therefore any small animals living in the vicinity are likely to have relocated away from the disturbance.

No fauna species listed as threatened under the provisions of either the EPBC Act or the NC Act were detected.

3.2 Road corridor including 7699-TP-29, 7699-TP-28 and 7699-RM-09

3.2.1 General

The road corridor (Mount Saltbush Road) on lot 5 WV434 is approximately 820 metres in length and includes geotechnical locations 7699 TP-29, 7699 TP-28 and 7699-RM-09, as shown in Figure 3.3

The road corridor traverses several lots. Only the portion occurring on lot 5 WV434 will be discussed in this report, with the exception of elements within the region that affect the ESA mapping of the corridor portion on lot 5.

The entirety of the road corridor and associated geotechnical locations on lot 5 WV434 are mapped as non-remnant vegetation, which is correct.

No ESAs occur within the road corridor or associated geotechnical locations on lot 5 WV434, and the nearest ESA is greater than 1km distant.

One minor watercourse of stream order 2 crosses the road corridor in the vicinity of 7699 TP-28.

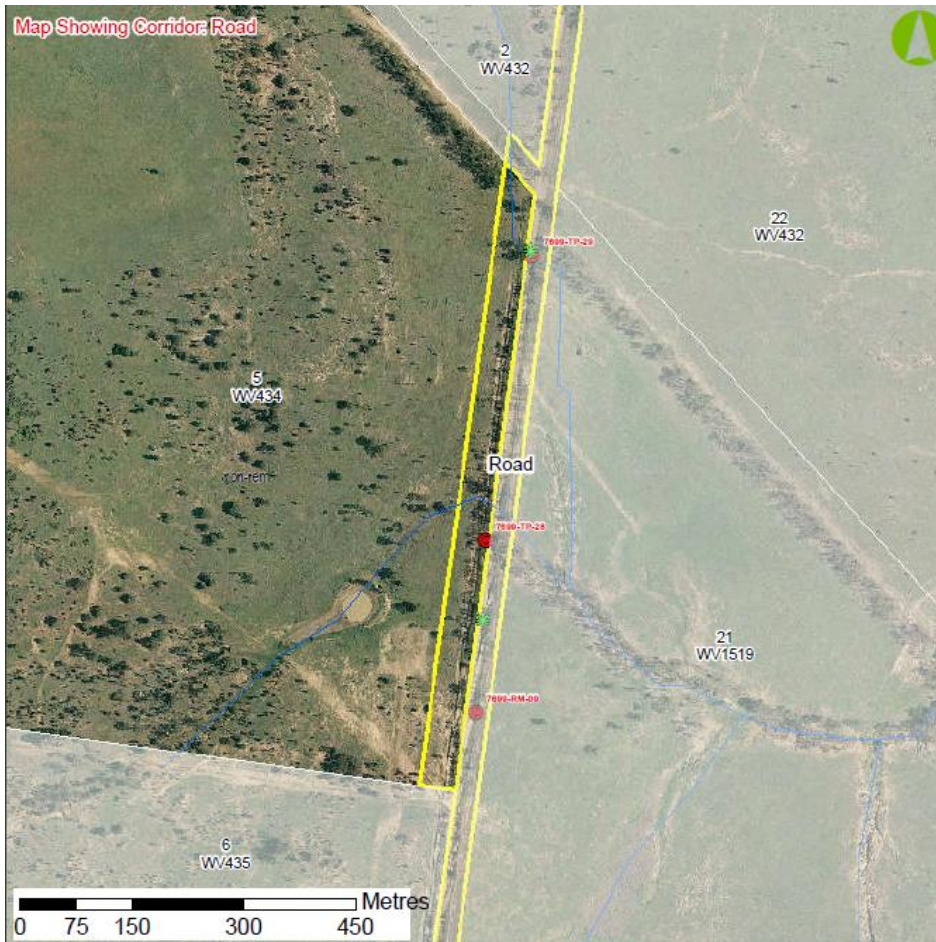


Figure 3.3 Aerial photograph of the road corridor on lot 5 WV434, including associated geotechnical locations, with overlaid RE and ESA mapping

3.2.2 Floristics

The road corridor occurs in cleared *E. populnea* (Poplar Box) woodland and is heavily disturbed. The area is scattered with occasional mature *E. populnea* and *Corymbia clarksoniana* (Clarkson's Bloodwood) individuals. Other shrubs include *Acacia excelsa* (Ironwood), *Geijera parviflora* (Wilga), *Grevillea striata* (Beefwood) and *Eremophila mitchellii* (False Sandalwood). The ground layer is dominated by *Pennisetum ciliare* (Buffel Grass), but a range of other native and exotic grasses are also present.

A flora species list was compiled for the entirety of the proposed road corridor, which did not distinguish between lots. Thus it is important to note that the species listed in Appendix A for this corridor were not necessarily present on the portion occurring on lot 5 WV434.

Two individuals of *Brachychiton populneus*, which is listed as a Type A restricted plant under the NC Act, were identified within the road corridor on lot 5 WV434. Their location is provided in Table 3.2. One of these occurs within the buffer zone of geotechnical location 7699-TP-29.

Table 3.2 Location of Type A Restricted Plants (*Nature Conservation Act 1992*) in the road corridor on Lot 5 WV434

Species	Disturbance affected	Easting (GDA 94, Zone 55J)	Northing (GDA 94, Zone 55J)
<i>Brachychiton populneus</i>	Road corridor, 7699-TP-29	700360	7080453
<i>Brachychiton populneus</i>	Road corridor	700295	7079960

No other flora species of conservation significance under the provisions of the NC Act or EPBC Act were present.

3.2.3 Habitat value

The habitat value of the proposed road corridor is moderate. Mature trees bearing hollows occur sporadically along its length, and large woody debris with hollows and fissured, flaky bark is also present in limited quantities. However, as the corridor is narrow and occurs within a highly fragmented landscape, its value to ground-dwelling and arboreal mammals would be marginal. Tree hollows were observed to harbour nesting birds in other parts of the road corridor on adjoining lots, and this is likely to be of greatest habitat value to local fauna species.

A fauna species list was compiled for the entirety of the proposed road corridor, which did not distinguish between lots. Thus it is important to note that the species listed in Table 3.3 for this corridor were not necessarily present on the portion occurring on lot 5 WV434.

No fauna species listed as threatened under the provisions of either the EPBC Act or the NC Act were detected.

Table 3.3 Incidental fauna species recorded in the Mount Saltbush road corridor on Lot 5 WV434

Species	Common name
Birds	
<i>Manorina melanocephala</i>	Noisy Miner
<i>Malurus melanocephalus</i>	Red-backed Fairy Wren
<i>Pardalotus striatus</i>	Striated Pardalote
<i>Struthidea cinerea</i>	Apostlebird
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Rhipidura fuliginosa</i>	Grey Fantail
<i>Rhipidura leucophrys</i>	Willie Wagtail
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
<i>Cracticus torquatus</i>	Grey Butcherbird
<i>Corvus orru</i>	Torresian Crow
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard



Species	Common name
<i>Aquila audax</i>	Wedge-tailed Eagle
<i>Acanthiza nana</i>	Yellow Thornbill
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater
<i>Cacatua roseicapilla</i>	Galah
<i>Nymphicus hollandicus</i>	Cockatiel
Mammals	
<i>Macropus rufogriseus</i>	Red-necked Wallaby
<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<i>Canis lupis dingo</i>	Dingo
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna



4 Conclusion

The proposed development areas on Lot 5 WV434 occur entirely within mapped non-remnant vegetation. Field investigation confirmed the vegetation mapping to be correct.

No ESAs were located within 1 km of the proposed development footprint.

Two minor watercourses were mapped within the proposed development area, which were classed as stream order 1 and 2.

Four (4) Type A restricted plants were identified within the proposal area – *Brachychiton rupestris* (Narrow Leaved Bottle Tree) and *Brachychiton populneus* (Kurrajong). No other flora species of conservation significance under the provisions of the NC Act or EPBC Act were present.

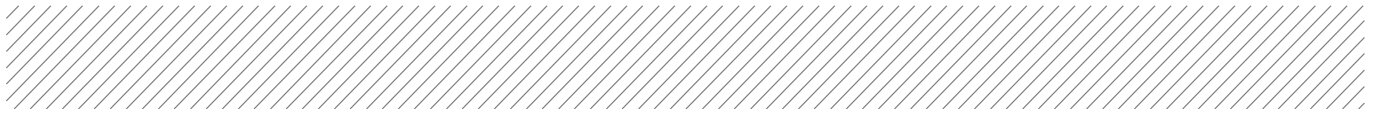
The habitat value of the proposed development areas was considered to be low to moderate. The areas have been heavily disturbed and have limited potential for shelter, nesting opportunities and food sourcing. No fauna species listed as threatened under the provisions of either the EPBC Act or the NC Act were observed within the proposed development areas of Lot 5 WV434.



5 References

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

Regional Ecosystem Mapping, Version 6.0, Queensland Government Department of Environment and Resource Management (DERM).



Appendix

Flora species lists

Flora Species within the Proposed Development Area of Lot 5 WV434

Scientific Name	Common Name	Corridors	
		Road	Pleasant Hills 32
<i>Abutilon leucopetalum</i>	Abutilon	x	
<i>Acacia deanii</i>	Dean's Wattle	x	
<i>Acacia decora</i>	Pretty Wattle	x	
<i>Acacia excelsa</i>	Iron wood	x	
<i>Acacia harpophylla</i>	Brigalow	x	x
<i>Acacia salicina</i>	Sally Wattle	x	
<i>Alectryon diversifolius</i>	Scrub Boonaree	x	
<i>Alectryon oleifolius</i>	Boonaree	x	
<i>Alphitonia excelsa</i>	Red Ash	x	
<i>Alstonia constricta</i>	Bitter Bark	x	x
<i>Alternanthera pungens</i>	Kaki Burr	x	
<i>Apophyllum anomalum</i>	Warrior bush	x	x
<i>Aristida holathera</i>	Tall Wire Grass	x	x
<i>Aristida ingrata</i>	Purple Aristida	x	
<i>Atalaya hemiglauca</i>	Whitewood	x	
<i>Atalaya salicifolia</i>	Scrub Whitewood	x	
<i>Austrostipa verticillata</i>	Slender Bamboo Grass	x	x
<i>Backhousia angustifolia</i>	Grey Myrtle	x	
<i>Bidens pilosa</i>	Cobblers Pegs	x	
<i>Bothriochloa bladhii</i>	Forest Blue Grass	x	
<i>Bothriochloa decipiens var. decipiens</i>	Pitted Bluegrass	x	
<i>Bothriochloa ewartiana</i>	Desert Blue Grass	x	
<i>Brachychiton populneus</i>	Kurrajong	x	x
<i>Brachychiton rupestris</i>	Narrow Leaved Bottle Tree		x
<i>Bracteantha bracteata</i>	Everlasting Daisy	x	
<i>Breynia oblongifolia</i>	Breynia	x	
<i>Bursaria spinosa</i>	Prickly Pine	x	
<i>Callitris glaucophylla</i>	White Cypress Pine	x	
<i>Calotis cuneifolia</i>	Purple Burr Daisy	x	
<i>Calotis lappulacea</i>	Yellow Burr Daisy	x	
<i>Canthium oleifolium</i>	Hat stand, Wild Lemon	x	

Scientific Name	Common Name	Corridors	
		Road	Pleasant Hills 32
<i>Capparis lasiantha</i>	Nipan, Wait a while	x	
<i>Capparis loranthifolia</i>			x
<i>Capparis mitchellii</i>	Bumble fruit	x	
<i>Capparis spinosa</i>	Capparis midsize	x	
<i>Carissa lanceolata</i>	Currant Bush	x	
<i>Carissa ovata</i>	Currant Bush	x	x
<i>Casuarina cristata</i>	Belah	x	
<i>Cheilanthes sieberi</i>	Mulga Fern	x	
<i>Chenopodium album</i>	Fat Hen	x	
<i>Chloris divaricata</i>	Windmill Chloris		x
<i>Chloris gayana</i>	Rhodes Grass	x	
<i>Chloris ventricosa</i>	Tall Chloris	x	
<i>Chloris virgata</i>	Silky Topped Rhodes Grass	x	
<i>Chrysocephalum apiculatum</i>	Yellow Buttons	x	
<i>Cirsium vulgare</i>	Spear Thistle, Black Thistle	x	
<i>Clerodendron parviflora</i>	Lolly Bush	x	
<i>Conyza bonariensis</i>	Fleabane	x	
<i>Corymbia clarksoniana</i>	Clarkson's Bloodwood	x	
<i>Corymbia tessellaris</i>	Moreton Bay Ash	x	
<i>Crotalaria dissitiflora</i>	Grey Rattlepod	x	
<i>Cucumis myriocarpus</i>	Paddy melon	x	
<i>Cymbopogon refractus</i>	Barbwire Grass	x	
<i>Cynodon dactylon</i>	Green Couch	x	
<i>Cyperus bifax</i>	Star Sedge	x	
<i>Cyperus difformis</i>	sedge 2 - difformis, Dirty Dora	x	
<i>Dianella longifolia</i>	Dianella	x	
<i>Digitaria ammophila</i>	Digitaria		x
<i>Dodonaea viscosa</i>	Sticky Hopbush	x	
<i>Dodonaea viscosa subsp. angustifolia</i>	Sticky Hopbush	x	
<i>Enteropogon acicularis</i>	Curly Windmill Grass		x
<i>Enteropogon ramosus</i>	Twirly Windmill Grass	x	
<i>Eragrostis brownii</i>	Browns Lovegrass	x	x

Scientific Name	Common Name	Corridors	
		Road	Pleasant Hills 32
<i>Eragrostis lacunaria</i>	Tall Love Grass	x	
<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	x	
<i>Eragrostis leptostachya</i>	Lovegrass	x	
<i>Eragrostis sororia</i>	Blue eragrostis	x	
<i>Eremophila debilis</i>	Winter Apple	x	
<i>Eremophila mitchellii</i>	False Sandalwood	x	
<i>Erythroxylum australe</i>	Cocaine tree	x	
<i>Eucalyptus melanophloia</i>	Silver Leaved Ironbark	x	
<i>Eucalyptus orgadophila</i>	Mountain Coolibah	x	
<i>Eucalyptus orgadophila X E populnea</i>	Boettchers Box	x	
<i>Eucalyptus populnea</i>	Poplar Box	x	x
<i>Euphorbia drummondii</i>	Caustic Weed	x	
<i>Eustrephus latifolia</i>	Wombat Berry	x	
<i>Evolvulus alsinoides</i>	Speed Well	x	
<i>Fimbristylis dichotoma</i>	Fimbristylis	x	
<i>Geijera parviflora</i>	Wilga	x	x
<i>Glycine tomentella</i>	Hairy Glycine	x	
<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush	x	
<i>Gomphrena celosioides</i>	Gomphrena Weed	x	
<i>Goodenia fascicularis</i>	Goodenia	x	
<i>Grevillea striata</i>	Beefwood	x	x
<i>Grewia latifolia</i>	Dysentery Plant	x	
<i>Hakea lorea</i>	Bootlace Oak	x	x
<i>Heteropogon contortus</i>	Black Spear Grass	x	
<i>Hibiscus brachysiphonius</i>	Bush Hibiscus	x	
<i>Hovea planifolia</i>	Hovea	x	x
<i>Jasminum didymum subsp. racemosum</i>	Native Jasmine	x	x
<i>Jasminum simplicifolium</i>	Native Jasmine	x	
<i>Juncus usitatus</i>	Juncus	x	
<i>Keraudrenia collina</i>	Keraudrenia	x	
<i>Keraudrenia hookeriana</i>	Keraudrenia	x	

Scientific Name	Common Name	Corridors	
		Road	Pleasant Hills 32
<i>Lepidium sagittulatum</i>	Pepper Cress	x	
<i>Lomandra longifolia</i>	Lomandra	x	x
<i>Lomandra multiflora</i>	Lomandra	x	
<i>Lomandra spicata</i>	Lomandra	x	
<i>Lotus corniculatus</i>	Lotus, Birdsfoot Trefoil	x	
<i>Lysicarpus angustifolius</i>	Budgeroo	x	
<i>Malvastrum americanum</i>	Spiny Malvastrum	x	
<i>Marsdenia longifolia</i>	Marsdenia	x	
<i>Medicago polymorpha</i>	Burr Medic		x
<i>Melinis repens</i>	Red Natal	x	
<i>Opuntia stricta</i>	Prickly Pear	x	
<i>Owenia acidula</i>	Emu Apple	x	
<i>Pandorea pandorana</i>	Wonga Vine	x	x
<i>Panicum decompositum</i>	Hairy Panic	x	
<i>Paspalidium caespitosum</i>	Brigalow Grass	x	
<i>Paspalidium distans</i>	Paspalidium	x	
<i>Paspalum dilatatum</i>	Paspalum	x	
<i>Pennisetum ciliare</i>	Buffel Grass	x	x
<i>Perotis rara</i>	Comet Grass	x	
<i>Pittosporum angustifolium</i>	Native Apricot	x	
<i>Pittosporum phyllirioides</i>	Wild Apricot	x	
<i>Pittosporum spinescens</i>	Wallaby Apple	x	x
<i>Pittosporum undulatum</i>	Pittosporum	x	
<i>Podolepis jaceoides</i>	Showy Copper Wire Daisy	x	
<i>Psyrax odorata subsp. australiana</i>	Canthium	x	
<i>Pterocaulon sphacelatum</i>	Apple Bush	x	
<i>Rumex brownii</i>	Swamp Dock	x	
<i>Santalum lanceolatum</i>	Sandalwood	x	
<i>Sclerolaena birchii</i>	Galvanised Burr	x	x
<i>Senecio queenslandicus</i>	Queensland Daisy	x	
<i>Senna artemisioides</i>	Senna	x	
<i>Senna artemisioides subsp artemisioides</i>	Silver Cassia	x	

Scientific Name	Common Name	Corridors	
		Road	Pleasant Hills 32
<i>Sida cordifolia</i>	Flannel weed	x	
<i>Sida platycalyx</i>	Sida		x
<i>Sida rohlenae</i>	Shrub Sida	x	x
<i>Sida spinosa</i>	Spiny Sida	x	
<i>Solanum ellipticum</i>	Potato Bush	x	
<i>Solanum nigrum</i>	Black nightshade	x	
<i>Sonchus oleraceus</i>	Sow Thistle		x
<i>Sorghum halepense</i>	Johnson Grass	x	
<i>Spartothamnella puberula</i>	Spiky Bush	x	
<i>Sporobolus caroli</i>	Desert Sporobolus	x	
<i>Sporobolus creber</i>	Western Rats Tail Grass	x	
<i>Swainsona galegifolia</i>	Swainsona	x	
<i>Tagetes minuta</i>	Stinking Rodger	x	
<i>Themeda quadrivalvis</i>	Grader Grass	x	
<i>Themeda triandra</i>	Kangaroo Grass	x	
<i>Tragus australianus</i>	Burr Grass	x	
<i>Urochloa mosambicensis</i>	Urochloa		x
<i>Urochloa panicoides</i>	Liverseed grass	x	x
<i>Ventilago viminalis</i>	Vine Tree	x	x
<i>Verbena litoralis</i>	Tall Verbena	x	
<i>Verbena officinalis</i>	Common Verbena, Native Verbena	x	
<i>Verbena tenuisecta</i>	Mayne's Curse	x	x
<i>Verbesina encelioides</i>	Crownbeard	x	
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	x	
<i>Xanthium occidentale</i>	Noogoora Burr	x	



Aurecon Australia Pty Ltd

ABN 54 005 139 873

Level 14, 32 Turbot Street
Brisbane QLD 4000

Locked Bag 331
Brisbane QLD 4001
Australia

T +61 7 3173 8000

F +61 7 3173 8001

E brisbane@aurecongroup.com

W aurecongroup.com

Key Contact

Jane Stark

Environmental Scientist

Level 14, 32 Turbot Street

BRISBANE QLD 4001

T +61 7 3173 8218

E jane.stark@aurecongroup.com

Aurecon offices are located in:

Angola, Australia, Bahrain, Botswana,
China, Ethiopia, Hong Kong, Indonesia,
Lesotho, Libya, Malawi, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Singapore, South Africa,
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