UNIDEL
ENERGY AND INFRASTRUCTURE

QUEENSLAND CURTIS LNG PROJECT (UPSTREAM COMPONENT)

Draft Flora and Fauna Assessment

Doc. No. QC LNG-00-N-RP01

1	Issued to Client	BT/SM	SF	SF	23 JUN 09
0	Issued for QGC Review	BT/SM	SF	SF	26 Feb 09
A	Issued for Internal Review	BT/SM	SF	SF	20 Feb 09
Rev	**Description**	**Originator**	**Reviewed**	**Approved**	**Date**

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EXECUTIVE SUMMARY

QGC, a BG Group business, is proposing to expand its coal seam gas (CSG) extraction activities in the Surat Basin to supply CSG for export, via a gas export pipeline and a liquefied natural gas (LNG) processing facility on Curtis Island, near Gladstone.

This flora and fauna report is concerned with the CSG extraction activities within QGC's CSG Fields. Through desktop and field investigations it identifies and describes the existing biological features and values that could be potentially impacted by the proposed CSG extraction activities. Values and impacts associated with the gas export pipelines and LNG facilities are considered in separate reports.

Proposed Activities
The CSG extraction activities will include development and operation over a 20 year period of the following infrastructure (approximately):

- 6,000 wells
- 2,000 km of access roads adjacent to low pressure pipelines
- 7,000 km of access roads or low pressure pipelines by themselves
- 27 Field compressor sites
- 9 Central processing plants, and
- 4-5 construction camps.

The location of the majority of the infrastructure sites are not known at this stage. Where possible it will be placed away from environmentally sensitive areas and outside of areas containing remnant vegetation. It is estimated that up to 3% of the remnant vegetation within the CSG Field vegetation may be required to be cleared in order to facilitate safe construction of this infrastructure.

Existing Environment
The CSG Field encompass vegetated as well as cleared grazing land, cropping land, roadside and travelling stock reserves, Council lands, State Forests and Resource Reserves.

Based on the Queensland Herbarium Regional Ecosystem (RE) mapping, approximately 297,455 ha of the total 468,700 ha CSG Field area is cleared. The remnant vegetation in the CSG Field equates to 171,255 ha and consists of approximately:

- 149,414 ha of Eucalypt woodlands
- 9,824 ha of shrubland on scalds, and
- 6,693 ha of riparian Eucalypt woodland
- 3,617 ha of Brigalow / Belah woodland
- 975 ha of Acacia woodlands
- 621 ha of Semi-evergreen Vine Thicket
- 111 ha of wetlands.

The CSG Field is known to contain two threatened Ecological Communities listed as Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth), Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and

Nandewar Bioregions. These communities are often small fragments in degraded condition. A small number of healthy patches remain.

There is potential for small patches of a third threatened Ecological Community (Weeping Myall Woodlands) to occur in the CSG Field. This Community is not mapped by the Queensland Herbarium RE mapping nor was it detected in the initial field survey. It is known to occur within the Brigalow South Bioregion, generally in small patches in alluvial soils in REs 11.3.2 and 11.3.28. As such, it may potentially occur in alluvial areas of the CSG Field.

In addition to the Brigalow and SEVT communities, one RE (RE 11.4.12 - *Eucalyptus populnea* woodland on Cainozoic clay plains) is listed as Endangered under the Queensland *Vegetation Management Act 1999* (VM Act). This RE is limited to small degraded patches.

Six REs listed as Of Concern under the VM Act and 20 Not Of Concern REs also occur in the CSG Field. Their ecological condition varies from degraded in many of the areas subject to rural residential and livestock grazing, through to very good (and a small number of excellent condition areas) usually within State Forest reserves.

Several State Forests occur in the CSG Field. The most outstanding one, in terms of biological values and ecological condition is Gurulmundi State Forest, in the north, which represents approximately 3% of the tenements.

Eight Endangered Vulnerable or Rare (EVR) flora species have been recorded within the CSG Field and an additional 25 could potentially occur within the CSG Field but are as yet unrecorded. A higher concentration of EVR flora is found within and immediately adjacent to Gurulmundi State Forest and in areas of exposed or shallowly covered lateritic duricrusts (ironstone jumpups).

Four regionally significant flora species and 326 least concern flora species were recorded in the CSG Field during the survey.

The CSG Field contains little in the way of aquatic flora, consisting primarily of a small number of common aquatic plants on the margins of waterways, farm dams, watercourse depressions, ephemeral wetlands and flood out areas. Although there are no records of EVR aquatic flora species within the CSG Field, two (*Eleocharis blakeana* and *Fimbristylis vagans*) are known to occur in the neighbouring Lake Broadwater (immediately east of the CSG Field). Under the right seasonal conditions, there is potential for these two EVR species, as well as the Queensland Lace Plant (*Aponogeton queenslandicus* listed as Rare), to occur within freshwater pools in watercourses, farm dams and weirs within the CSG Field.

Only two declared weeds are known to occur in the CSG Field, namely:

- Mother of Millions (*Bryophyllum delagoense*), and
- Prickly Pear (*Opuntia* spp.).

Mother of Millions displaces native ground storey species in a range of native communities. Prickly Pear invades a wide range of native communities. These declared weeds are most prevalent in communities on alluvium (river and creek flats), which have more fertile soils. Lowest weed levels were recorded in communities on sand plains and lateritic soils.

Numerous environmental weeds occur in the CSG Field were also recorded during field surveys. Species that may impede rehabilitation works following construction include:

- Maynes Pest (*Verbena tenuisecta)*

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- Mimosa Bush (*Acacia farnesiana*), and
- Exotic pasture and roadside grasses, such as:
  - African Love Grass (*Eragrostis curvula*)
  - Buffel Grass (*Cenchrus ciliaris*)
  - Guinea Grass (*Megathyrsus maximus* - syn. *Panicum maximum*).

Many vegetated areas have been ecologically degraded by Buffel Grass and Guinea Grass, both of which have the capacity to displace native ground storey species and alter fire regimes irrevocably. Buffel Grass is now recognised as an emerging environmental weed of considerable importance (Best 1998; Clarke *et al*. 2005; Greenfield 2007). It is also widely used in the region as a pasture grass.

Fauna habitats on most rural lands and roadside verges in the CSG Field are fragmented and substantially degraded. Most areas have a long history of grazing, timber removal and invasion by environmental weeds. Nevertheless, some areas, particularly riparian zones, have significant fauna habitat values with a relatively high percentage of hollow-bearing trees, moderate to high levels of understorey vegetation and leaf litter. The relatively moist riparian environments also support regular and heavy flowering eucalypt communities, and these are important food sources for many bird species.

From observations made during the surveys it seems likely that several factors have combined over a period of time to reduce the native biodiversity of large portions of the CSG Field. These factors vary in their influence across the region and also between habitat types. They include:

- Frequent cool winter fires that have removed ground cover in many habitats. These fires are likely to have removed food resources and exposed fauna to elevated predation risks (Garden et al. 2007b; Letnic 2007; Priddel et al. 2007)
- In the southern areas of the CSG Field, foxes are particularly abundant and these highly efficient predators are well known to pose a serious risk to terrestrial fauna, particularly were ground cover is scant (Briggs *et al*. 2007; Gentle *et al.* 2007; McKenzie *et al*. 2007; Priddel *et al*. 2007; Salo *et al*. 2007)
- Grazing and the establishment of environmental weeds, particularly Buffel Grass, are a serious threat to the integrity of many fauna habitats. Buffel Grass is now becoming widely recognized as a serious environmental weed in natural habitats but is also an important pasture grass for graziers (Best 1998; Clarke *et al*. 2005; Greenfield 2007), and
- Grazing has also exerted significant pressure on many natural habitats and has substantially degraded understorey vegetation structure in some areas (Munro *et al*. 2007).

The survey found no bandicoots, bettongs or other terrestrial mammals in this size range in the CSG Field south of the Warrego Highway. Also notably absent were leaf litter dependent species such as Death Adders (*Acanthopis antarcticus*) and the Brigalow Scaly-foot (*Paradelma orientalis*).

Detailed fauna surveys conducted for this report recorded 213 species consisting of 30 mammal, 145 bird, 24 reptile, 13 frog species and 1 butterfly species. Of these, 7 mammals, 3 birds and 1 amphibian were introduced species.

In total, 33 EVR fauna species have the potential to occur in the CSG Field. These include:

- 4 Endangered, 12 Vulnerable, 11 Migratory and 6 Marine under the EPBC Act.

This is made up of 22 bird species, 6 reptile species, 3 mammals (all bats), 1 fish and 1 insect.

Eight of these EVR fauna species were recorded during the field assessment within the CSG Field (three bird, three bat, one reptile and one butterfly species). Two additional EVR bird species where recorded at Lake Broadwater, just outside the south-east corner of the CSG Field.

A further nine Priority Species listed under the BAMM Assessment for the Brigalow Belt South Bioregion (Criteria H) were also identified during the detailed field surveys.

Queensland Museum and WildNet records identify 18 species of fish which are known to occur within the QGC Field, two of which are introduced. One species, the Murray Cod, is listed as vulnerable under the EPBC Act and also as a Priority Taxa under BAMM Criteria H. The Southern Purple-spotted Gudgeon is also listed as Priority Taxa under BAMM Criteria H.

There are two major wetlands which are outside of, but in the vicinity of the CSG Field. These are Lake Broadwater Conservation Park and Resources Reserve just outside the south eastern corner of the CSG Field and The Gums Lagoon located to the south west of the CSG Field. The CSG field area also contains a number of small areas mapped by the Queensland Herbarium mapping as freshwater wetlands. These are all small ephemeral wetlands, in most cases closely associated with, and in close proximity to significant watercourses. Analysis of satellite imagery indicates that most are subject to grazing and in degraded to average condition.

Environmentally sensitive areas occurring in the tenements include:

- State Forests
- Threatened Species and Ecological Communities (EPBC Act)
- Endangered REs (VM Act) (incorporated within BAMM Methodology)
- Of Concern REs (VM Act)
- Woodlands fringing drainage lines (RE 11.3.25)
- Wetlands (RE 11.3.27)
- EVR and regionally significant species habitats, and
- Large intact tracts of vegetation.

Potential Impacts

It is important to note that over the longer-term, the CSG Field infrastructure is likely to be decommissioned within several decades. Subject to the exception that landholders may, at that future time, choose to manage their properties in a manner that inhibits natural regrowth; the impacts associated with the proposed clearing of remnant vegetation for construction and maintenance are considered to be reversible in the long term.

The worse case short term vegetation loss to facilitate construction of the infrastructure is estimated to be 4,624 ha of Not of Concern Remnant Vegetation. This represents just under 3% of that which currently exists on the tenements.

Wherever possible, remnant vegetation is to be avoided. Where unavoidable, rehabilitation and offset activities are proposed to minimise this impact and compensate for the loss of vegetation. The clearance area requirements for construction is greatest during the development phase but can then be reduced once production is established.

Other potential impacts include:

- The movement of machinery and vehicles between areas, which has the potential to spread weeds including declared weed species, such as Parthenium Weed and Giant Rat's-tail Grass as well as environmental weeds into areas in natural condition (e.g. Buffel Grass into State Forests)
- The activities of machinery and construction operations may increase the likelihood of wildfires
- Initial drilling activities result in the production of associated water which is very mildly saline (generally 2,000-5,000 ppm), and so vegetation in the vicinity of the wells may be impacted if water tables are affected or if extracted water flows into nearby vegetation
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure
- Sedimentation and nutrification of aquatic habitats
- Removal of habitat such as mature vegetation, hollow-bearing trees and fallen logs, and therefore loss of nesting, shelter and foraging resources
- Fragmentation of habitat due to flow line and access road construction. These features may act as movement barriers, particularly to fossorial species, and alter movement patterns. They may also limit access to dry season fauna refuges associated with riverine environments
- Access for predators – dingoes and to a lesser extent, foxes and cats are known to follow roads and tracks as they provide easy access paths. This may open up new habitats and expose fauna to elevated predation risks
- Noise and increased human activity, particularly during site development may restrict species movements and limit access to food or other resources
- The potential for fauna mortality during clearing activities
- The potential for fauna mortality due to entrachment in open trenches.
- The potential for road kills along access tracks will elevate mortality risks for some species.

The project could potentially bring about beneficial affects by protecting and improving environmental values through conservation focussed offsets and land management initiatives (e.g. fire management and infrastructure, weed and pest management, livestock exclusion and fencing).

In the absence of appropriate mitigation measures the potential for the Project to impact on EVR flora would be high for 6 species and moderate for 10. However, it is expected that the implementation of such mitigation measures would enable the Project to avoid significant impacts on all EVR flora.

Even in the absence of mitigation measures, the potential to impact on EVR fauna species is low for all except four species, for which there is moderate potential. If the recommended mitigation measures are successfully implemented there is no to low potential that these species will be significantly impacted..

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Based on the fact that no more than 3% of the existing vegetation is required to be cleared for construction of the CSG infrastructure and assuming that mitigation measures are put in place, there is little potential for the Project to have a significant impact on aquatic or Least Concern flora or fauna species.

Lake Broadwater Conservation Park and Resources Reserve is downstream of Broadwater gully which is situated within the CSG Field (ATP 648). Consequently without appropriate mitigation measures, there would be potential for some impacts by nutrient and sediment flows and accidental releases of Associated Water. Gums Lagoon is not downstream of the CSG Field therefore this wetland is not expected to be indirectly impacted by the proposed developments.

Due to their sensitivity, areas mapped by the Queensland Herbarium as ephemeral wetlands within the tenements could, if CSG activities were conducted in close proximity, potentially be impacted through sedimentation, nutrification and accidental release of Associated Water. However, no significant direct or indirect impacts to wetlands are considered likely provided that the recommended mitigation measures set out in this report (which include excluding CSG activities from these wetlands) are employed.

Mitigation and Rehabilitation Recommendations

Ecological constraints mapping has been developed based on Environmentally Sensitive Areas mapping to formulate a zoning system so that more stringent environmental conditions can be applied to areas of high conservation value and less stringent conditions where conservation values are lower.

The mapping is primarily based on RE polygons and tenure considerations. In order to translate this into workable constraints zones for field operations, the mapping has been simplified and four constraints zones have been recommended. They are:

- Zone 1 Minimal Ecological Constraints (63% of CSG Field)
- Zone 2 Medium Ecological Constraints (18%)
- Zone 3 High Ecological Constraints (8%), and
- Zone 4a and Zone 4b Very High Ecological Constraints (11%).

Mitigation and rehabilitation recommendations have been presented for each of these Zones.

Zone 4a and 4b included areas with the highest ecological values. These values could potentially be significantly impacted by the CSG activities. It is therefore recommended that all non-linear CSG infrastructure be excluded from these Zones.

Zone 4a areas are considered to have higher conservation values than Zone 4b. They are distinguished from each other only for the purpose of enabling planning of linear infrastructure to avoid Zone 4a areas in preference to Zone 4b areas in locations where such areas are unavoidable.

Areas within Zone 4a include:

- Gurulmundi State Forest and the Environmentally Sensitive area immediately north west of the State Forest (the location of linear infrastructure (e.g. pipelines

and access tracks) through this area should be determined by ecologist field studies at the detailed design stage to follow existing tracks and previously disturbed areas where possible and to avoid or minimise disturbance of highest value areas (e.g. EVR plant populations, high quality fauna habitats, steep terrain). QGC will not undertake drilling or development of non-linear infrastructure in this area prior to government endorsement of detailed development plans showing proposed production techniques and infrastructure locations. Such a plan would be based on detailed ecological investigations within this area and would aim at ensuring that any such development would be undertaken in an ecologically sustainable and acceptable manner.

- EPBC Act listed Ecological Communities, and
- The EPA defined Category B Environmentally Sensitive Areas which, in the CSG Field, include:
  - VM Act Endangered Res, and
  - Additional REs classified as Endangered under the EPA's Biodiversity Status.

Areas within Zone 4b include:

- RE 11.3.27 (ephemeral wetlands), and
- Buffer zones adjacent to watercourses in accordance with the Environmental Authority conditions for QGC's existing operations, namely:
  - 50m from Stream Order 1 and 2 watercourses
  - 100m from Stream Order 3 and 4 watercourses, and
  - 200m from Stream Order 5-8 watercourses.

It is recognised that in a small number of instances linear infrastructure (e.g. collection lines, pipelines and access tracks) will be unable to avoid transecting linear remnants and watercourses of very high ecological value (i.e. Zone 4 a and b areas). Provided such unavoidable impacts are minimised and compensated for by offset initiatives the proposed activities will not have a significant impact on the conservation values of these areas.

Zone 3 (High Ecological Constraints) areas include all State Forests (excluding Gurulmundi State Forest). Additional recommendations that apply to these areas include:

- All CSG Activities to be planned and undertaken in close liaison with EPA State Forest Management staff
- Site access to be only along existing cleared tracks, fire trails and easements. Where this is not possible, access is to be negotiated with EPA State Forest management staff
- EPA and/or independent flora and fauna consultants to be involved in detailed pre-clearance surveys as part of early planning for infrastructure locations
- Pads for gas extraction are to be of minimum safe area and placed against the edge of existing easements where possible, in order to minimise fragmentation effects
- Use of "Best Available Technology" to minimise clearing requirements
- Access tracks are to be incorporated into pad clearance areas where possible to minimise total clearing requirements

- Extraction methodologies that minimise the density of well pads in these areas (e.g. horizontal drilling) be investigated and used where practicable, and
- Implementation of special weed washdown, monitoring and control measures.

General recommendations for all other areas (i.e. Zone 1 and 2 areas) should include continuation of current environmental management practises as well as a number of additional and more specific activities (e.g. compensatory offsets, specific weed controls, systematic use of fauna handlers, fire management planning).

Conclusion

Provided that the recommended mitigation and rehabilitation measures are adopted and successfully implemented, the proposed CSG extraction activities will be unlikely to have a significant impact on the biological features and values described in this report

1.0 PURPOSE

This report is prepared in accordance with the Draft TOR for the Queensland Curtis LNG Project (QC LNG) and provides specialist flora and fauna assessments of the CSG Field shown in **Figure 1**.

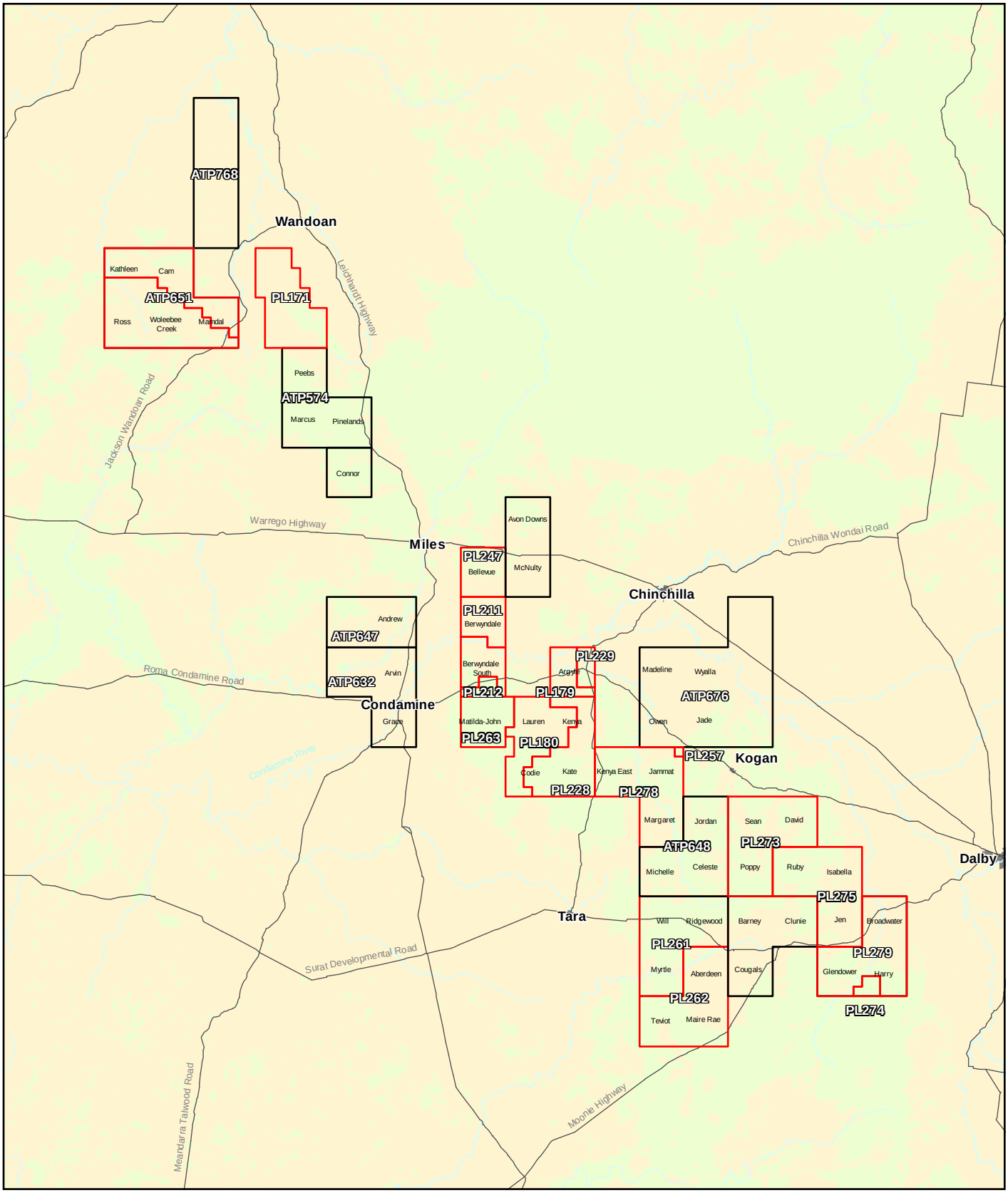
A stand alone report which specifically considers only those matters of significance under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is provided in **Attachment 1**.

The area is 468,700 ha and is located in the Surat Basin. The CSG Field extend from near Wandoan in the north to south-east of Tara in the south.

The flora and fauna studies consider publically available databases and published information on the project area as well as detailed field surveys undertaken specifically for the QC LNG Project (henceforth referred to in this report as the Project).

This report examines the potential and known occurrences of protected plants, animals and communities as identified under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Queensland *Nature Conservation Act 1992* (NC Act) and the Queensland *Vegetation Management Act 1999* (VM Act). The study also considers regionally significant species and areas of special biodiversity value as identified in the Queensland Government's EPA Biodiversity Assessment and Mapping Methodology for the Brigalow Belt South Bioregion, and declared weed species under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act). General biodiversity values, evaluated in terms of common flora and fauna, are also considered. Environmentally Sensitive Areas are mapped and described.

The report discusses the nature conservation values of the areas likely to be affected by the CSG Field activities and identifies mitigation measures to assist in avoiding or minimising impacts on Environmentally Sensitive Areas, areas of remnant vegetation and other areas of conservation value. Where avoidance is not possible, recommendations are made in relation to appropriate offset activities.



Legend:

- CSG Fields - ATP
- CSG Fields - PL

Source Note:

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Projection UTM MGA Zone 56 Datum GDA 94

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QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title: Coal Seam Gas Field - Overview
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn GH	Figure 1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved xx	File No: QC02-T-MA-0031	
	Date 25.02.09	Revision A	

2.0 BACKGROUND

2.1 Location

The CSG Field is located within the Surat Basin, a resource region in southern Queensland. The tenures are within the Dalby Regional Council and in the vicinity of Miles, Chinchilla, Condamine and Tara townships (**Figure 1**). The Condamine River bisects the tenure areas and the predominant land use is rural for grazing and dry land cropping. Rural residential blocks occur through central portions of the CSG Field, particularly in the vicinity of Tara.

2.2 Proposed Infrastructure

The proposed expansion activities are detailed in the QC LNG EIS. In summary, the typical types of infrastructure which are proposed include wells, in-field compression, water storage ponds and pipelines, low pressure gas and water pipelines and access tracks. There will also be a requirement for a processing plant, several compressor stations, some high pressure gas transmission pipelines and a small number of construction camps.

Currently there are approximately 270 wells (including exploration, core and production wells) on the CSG Field. There is a requirement for approximately 1400 production wells by the end of 2013 (and a total of 1600 by the end of 2014 to support the Project). On completion of the proposed expansion, there will be approximately 6,000 wells developed over 20 years. At completion, wells are likely to be located at approximately 750 m spacings, equating to approximately 120-130 wells per graticular block (approximately 8.3 km x 9.4 km or 7,800 ha).

The following clearing footprints are considered typical for the QGC operations:

- 1 ha for wells
- 15 m width for access roads adjacent to low pressure pipelines (approximately 2,000 km)
- 10 m for access roads or low pressure pipelines by themselves (approximately 7,000 km), and
- Several hectares each for:
    - 27 Field compressor sites
    - 9 Central processing plants
    - 4-5 construction camps.

As such, the well footprints would cover approximately 1.3 % of the CSG Field. Footprints for access roads, gathering pipelines and other infrastructure would cover up to an additional 1.7 % of the tenement area.

Studies and pilot projects are ongoing to evaluate options for the beneficial use of associated water. Applications for the beneficial use of associated water under *Environmental Protection (Waste Management) Regulation 2000* (Qld) will be required to utilise the associated water generated from the CSG Field development. Off-lease use of associated water will also require licensing under the *Water Act 2000* (Qld). The water storage ponds proposed for future expansion activities are relatively small (typically <0.5 ha) storage ponds

associated with individual wells or small groups of <6 wells and possibly a small number of large scale evaporation ponds (which have been approved and developed for existing activities).

High pressure gas pipelines associated with the QC LNG activities include a 200 km Upstream Infrastructure Corridor within the CSG Field in addition to a 380 km export header connecting the CSG Field to the proposed LNG plant in Gladstone and a 220 km lateral which would connect the export pipeline to other CSG Fields in the Spring Gully area, east of Injune. These high pressure gas pipelines are the subject of a separate referral to the Department of Environment, Water, Heritage and the Arts (DEWHA) and are not considered within this report.

2.3 Process of Locating Infrastructure

The CSG wells will be developed over the initial 20-year life of the Project. CSG Field development is constrained and defined by the physical location of the CSG Fields. Gathering systems and well placement are negotiated with all stakeholders and are focused on safety requirements and the avoidance of environmentally or culturally sensitive locations. The productivity and other characteristics (e.g. sandiness) of existing wells determine the location and priority for development of future wells (and therefore the locations of associated access roads, low pressure pipelines, compressor stations and construction camps). As such, it is not possible to identify the location of the vast majority of the proposed infrastructure at the beginning of such a long project. Actual locations of wells and their support infrastructure will be identified as part of an ongoing detailed drilling and infrastructure works programs for the Project.

The CSG wells are generally located in groups of five wells spaced using an optimal ‘axe head’ layout with wells in each axe head group being approximately 750 m apart.

The CSG Field development activities will include:

- Commercial well development (access land clearance, well lease development, gathering lines and sumps)
- Construction of in-field screw compressor stations (27 stations, with each station containing a bank of 8 screw compressors)
- Construction of gas processing and reciprocating compressor plants (nine central processing plants, each containing a bank of ten reciprocating compressors) connecting to the high pressure gas pipeline network and associated water separating and dehydration facilities
- Management of associated water (pondage, delivery lines and beneficial use alternatives within the CSG Field and in the wider Darling Downs region). Management of associated water and required infrastructure was still to be determined at the time of this assessment
- Construction of required camps and field support facilities (offices and warehouse etc.), and
- Water research and development activities (reinjection, crop trials and environmental offset options).

Much of the processing and compression facilities and other supporting infrastructure, such as camps and evaporation ponds will be constructed in the Project's ramp-up phase (pre-2013).

Operational activities will include:

- Well operation and maintenance
- Access road maintenance
- Stakeholder land maintenance
- Property management
- Offset management
- Compression and Processing Plant operation and maintenance, and
- Associated water infrastructure operation and maintenance.

Rehabilitation will be progressive over the life of the Project. However, with the typical well life being up to 25 years, the majority of rehabilitation will occur in the later years of the lifetime of the project. Rehabilitation activities will commence sequentially at ramp-down/cessation of commercial production for depleted wells.

2.4 Existing Environmental Authority Conditions

Thirteen Petroleum Leases (PL) (including current applications) and four pipeline licences are held within the CSG Field acreage. These tenures are subject to one Project Environmental Authority under the *Environmental Protection Act 1994* (Qld) for activities in the Walloon Fairway area (excluding PL 201and PLA 180).

The environmental protection conditions stipulated in the EA that relate to vegetation management, riverine areas and Environmentally Sensitive Areas are shown in **Attachment 2**. They include:

- Minimise disturbance to vegetation
- Minimising disturbances near riverine areas, watercourses and water bodies
- Minimise disturbance in or near category A or B Environmentally Sensitive Areas (ESAs)
- Not conducting any activities within category C ESAs without approval from the relevant administering authority
- Where no reasonable alternative exists, disturbance within (or within 500 m of) an endangered regional ecosystem must be located according to the following order of preference:
    a. Pre-existing disturbance areas within the 500 m buffer of the ESA
    b. >100 m from the ESA
    c. <100 m but outside the ESA
    d. Pre-existing disturbance areas within the ESA
    e. Areas within the ESA of lower environmental value

f. Within the ESA but not to exceed 10 % of a polygon mapped as an endangered regional ecosystem (and all reasonable effort is made to minimise the area cleared and to avoid clearing mature trees).

- This unavoidable clearing within an endangered regional ecosystem (or within 500 m) cannot be:

g. >10 % of a polygon mapped as an endangered regional ecosystem

h. >3,600 m^2 for the operational area of a drill site within an endangered regional ecosystem

i. >30 m^2 for construction of a sump within an endangered regional ecosystem

j. >6 m in width for tracks that are necessary within an endangered regional ecosystem

k. >12 m in width for pipeline construction purposes that are necessary within an endangered regional ecosystem.

All of the EPBC Listed communities and VM Act Endangered Regional Ecosystems (REs) that are known to occur on the QGC CSG Field are protected under the Queensland legislation and are therefore captured in the existing EA conditions. In particular, the current EA conditions prohibit QGC from clearing any of the mapped VM Act Endangered REs except where unavoidable.

2.5 Existing QGC Environmental Clearance Procedures

The existing QGC field development activities are undertaken in accordance with the Level 1 EA for the petroleum activities on its CSG Field. The standardisation of environmental management across the CSG Field has progressed under a project Environmental Management Plan which details the potential impacts, environmental protection objectives and environmental mitigation measures/controls for petroleum activities to be undertaken (**Attachment 3**). This has been prepared in consultation with the EPA to meet the regulatory requirements.

There are effectively two stages at which QGC currently ensures that future infrastructure locations avoid or minimises disturbance of VM Act Endangered REs (and EPBC listed communities). These are:

- Macro-scale avoidance, where planning avoids known areas of VM Act Endangered REs and EPBC listed communities through desktop reference to existing government Regional Ecosystem (RE) mapping, and

- Micro-scale avoidance, where the site clearance procedure allows infrastructure to avoid or minimise disturbance of unmapped communities, as well as listed flora species, fauna habitat features and other environmental values and features of significance.

Initial desktop assessments identify the known locations of VM Act Endangered REs and Of Concern REs and this information is used in the planning phase for locating any infrastructure so as to avoid and minimise disturbance to these REs/ communities.

Once a generally desirable location for each proposed well (or other infrastructure) is identified, a significant amount of flexibility remains in relation

to its precise location. The current QGC environmental clearance procedure (**Attachment 4**) allows the environmental officer to relocate the proposed location by up to 50 m without need for consultation with the geologist. Where the environmental officer identifies a need to relocate a proposed well site by greater than 50 m, this is to be done in consultation with the QGC geologist. An identical and concurrent procedure is used by the cultural heritage monitors and construction engineers. The environmental clearance survey facilitates avoidance of unmapped REs / communities and flora species as well as fauna habitat values and other environmental values and features. An example of a completed environmental clearance checklist is provided in **Attachment 5**.

3.0 SCOPE

The scope of this flora and fauna assessment was to:

- Assess the existing flora and fauna assemblages of the CSG Field through both desktop and field studies, including identification and description of the following key values:
  - Threatened Ecological Communities with reference to the Australian Government's EPBC Act and Queensland Government's RE classification
  - Observed or potentially present taxa listed as rare or threatened under the EPBC Act and the Queensland NC Act (EVR species)
  - Observed or potentially present taxa listed as priority taxa under the EPA Biodiversity Mapping Methodology for the Brigalow Belt South Bioregion
  - General flora and fauna values
  - Aquatic flora and fauna
  - Pest flora and fauna
  - Wetlands
  - Other Sensitive Environmental Areas
- Identify potential impacts to flora and fauna that may occur as a result of project works and evaluate the scope and nature of these impacts, and
- Identify appropriate mitigation measures to help avoid and minimise these potential impacts.

4.0 ASSUMPTIONS AND LIMITATIONS

The northern most tenements shown as ATP768 and PL171 in **Figure 1** were included as part of the CSG Field after the fieldwork was completed. As such, the assessment of these areas was limited to a desktop assessment. Field assessment of these areas will be undertaken prior to the commencement of construction activities.

Scale-dependant inaccuracies are found to occur within Queensland Herbarium RE mapping; for example, small remnants along creeks and road reserves may not be detected and small scale variation within larger remnants may not be recognised.

During the flora and fauna assessment, wherever possible at least one occurrence of each RE was visited and ground truthed. However, it was not possible to ground truth every RE occurrence in the CSG Field due to landholder access constraints.

The existing Queensland Herbarium RE mapping was used to estimate the areas of each RE type which occur within the CSG Field and the wider study area. Fauna habitat mapping has been derived from the same sources and is subject to similar assumptions and limitations.

Detailed flora and fauna assessments were carried out over as much of the CSG Field as possible, however a significant degree of extrapolation was required when applying these values to the whole of the CSG Field. When compiling the desktop assessment, a species was considered to occur in the area if it was recorded in database searches for the region and suitable habitat was considered to occur in the area, based on existing knowledge of the species' ecological requirements. When analysing field survey results, the extrapolation of fauna values was based upon the assumption that the habitat type in which a species was recorded, was likely to support that species elsewhere. Both desktop and field surveys may therefore have over-estimated the distributional extent of some species. Thus a precautionary approach has been adopted throughout this assessment and such assumptions are explicitly stated in the relevant discussions.

The specific locations for wells, access roads, compressor stations, construction camps and other support infrastructure which will be required during the life of the project were not known at the time of the assessment.

5.0 ASSESSMENT METHODOLOGY

5.1 Flora Assessment

5.1.1 Determination of Significance Level

Regional Ecosystems defined under the VM Act are assigned a status based on their current geographical extent, compared to the extent that existed pre-clearing. Remnants are classified as Endangered, Of Concern and Not of Concern. Threatened Ecological Communities are defined under the EPBC Act and are generally readily translated to RE descriptions.

Listed EVR flora are defined as those taxa listed;

1) In the EPBC Act as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable or Conservation Dependant, and

2) In the NC Act as Endangered, Vulnerable or Rare.

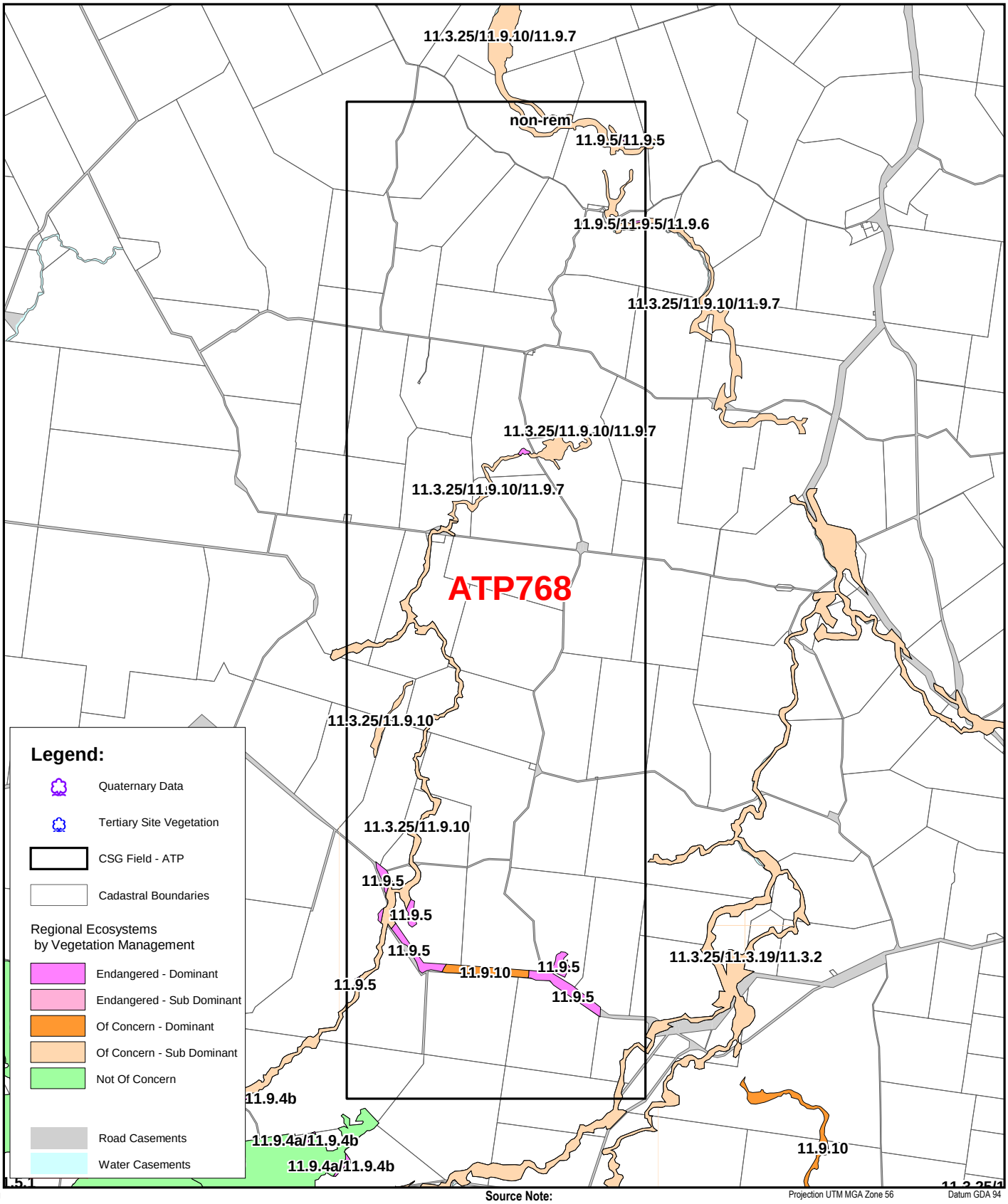
Regionally Significant flora are defined as those taxa that have not been listed under the EPBC Act or NC Act, but have been identified by the Biodiversity Assessment and Mapping Methodology (EPA 2008b) as priority taxa for the Brigalow Belt Bioregion.

All other native flora is considered Least Concern.

5.1.2 Flora Desktop Assessment

The flora desktop assessment included:

- Review of Queensland Herbarium HERBRECS data, wildnet database and DEWHA Protected Matters flora data which was initially sourced 10 April 2008 and updated 8 December 2008. The data search area was rectangular, covering an area at least 10 km either side of the CSG Field (equating to the area -25.822778° S to -27.435833° S and 149.460278° E to 151.179722° E)
- Review of Queensland Herbarium RE mapping (Version 5.0, 2005) for a 10 km buffer around the CSG Field to establish those vegetation communities mapped by the EPA at a scale of 1:100 000 (**See Figure 2a-l**)
- Examination of satellite imagery to gain an appreciation of the project's proximity to sensitive areas, assess vegetation patterns and identify target areas for field investigations
- Review of the EPA Brigalow Belt South Biodiversity Planning Assessments (EPA 2008a), EPA Biodiversity Planning Assessment Brigalow Belt South Flora Expert Panel Report (EPA 2008b) and the Biodiversity Planning Assessment Brigalow Belt South Landscape Expert Panel Reports (EPA 2008c) to identify species and areas that are recognised as State, Regional or Local Biodiversity Significant or are flagged as important for their integrated biodiversity values within close proximity to the project area
- Review of the DERM Biodiversity Assessment and Mapping Methodology (BAMM)
- Review of the DERM Environmentally Sensitive Areas Mapping (ESAs)
- Review of the DERM Essential Habitat Areas Mapping, and



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Quaternary and Tertiary Sites captured by Ann Moran using Trimble Nomad (+/-15m)

Projection UTM MGA Zone 56 Datum GDA 94

0 1.5 3 4.5 6

Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

Project: Queensland Curtis LNG Project

Client: QGC - A BG Group business

Title: **Mapped RE's within CSG Fields - ATP768**

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	DB	**Figure**	**2a**
Approved	CDiP	File No:	
Date	25.02.09	Revision	A

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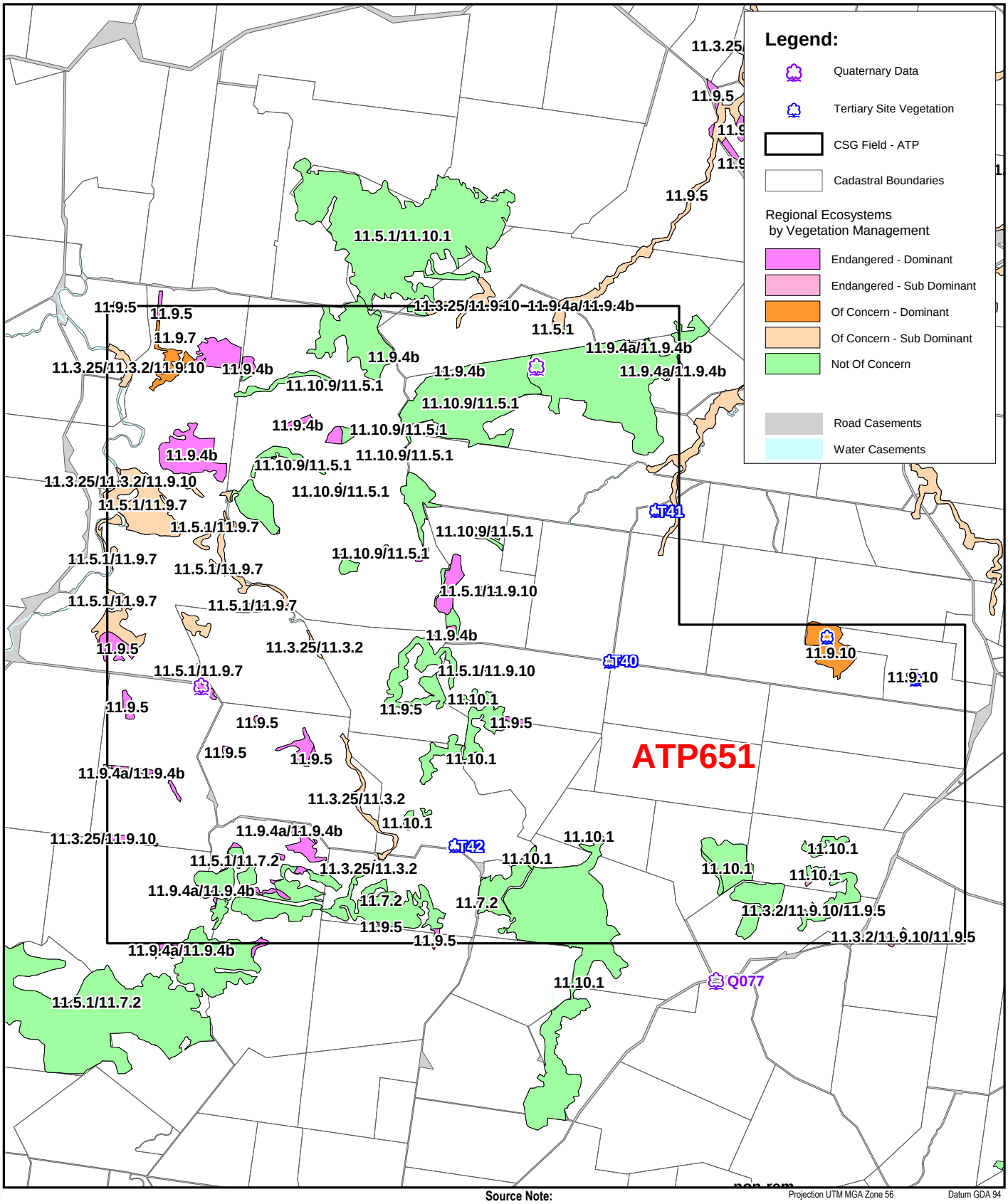

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Kilometres

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A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title **Mapped RE's within CSG Fields - ATP651**

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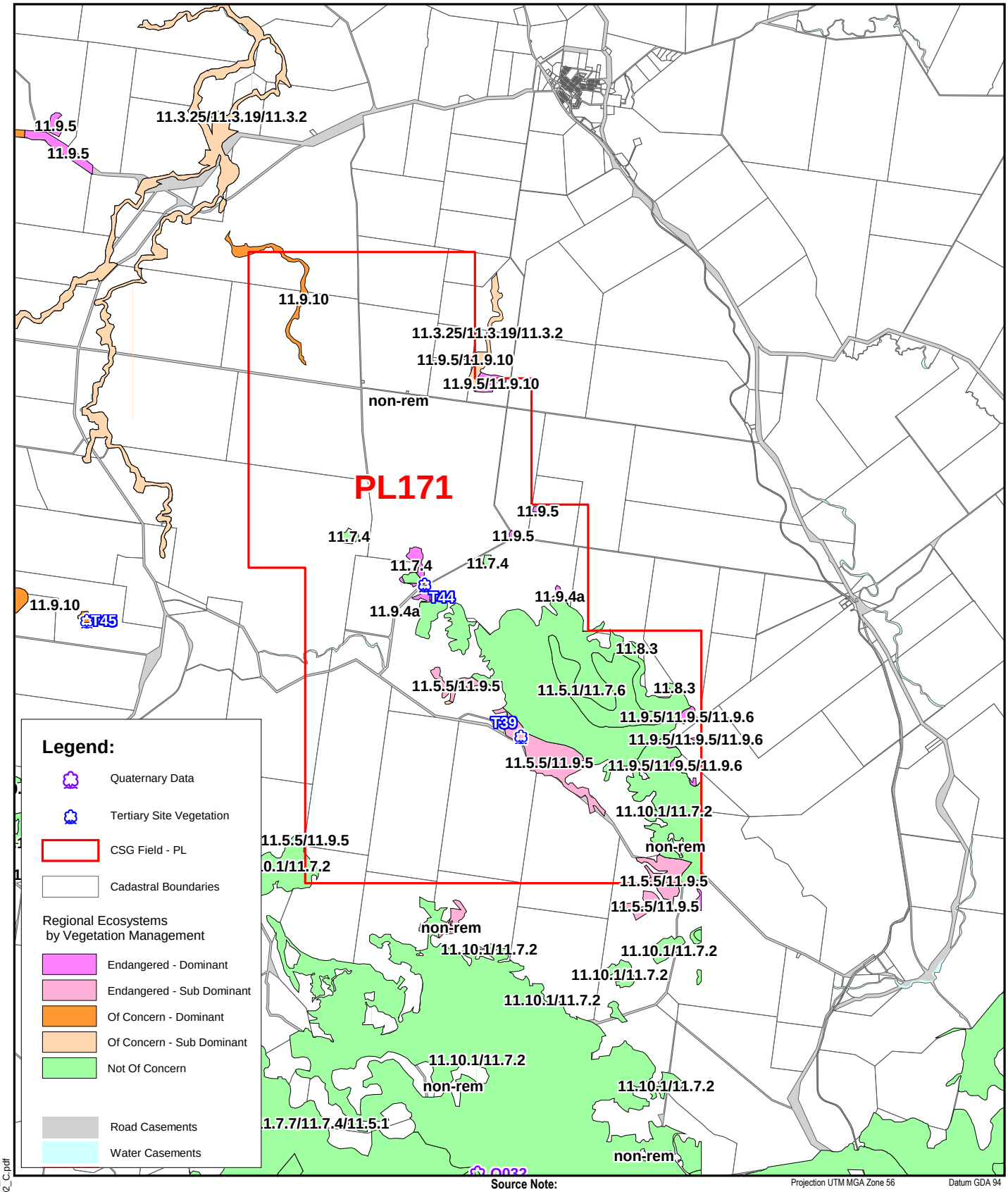

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QUEENSLAND CURTIS LNG
A BG Group business

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Project	Queensland Curtis LNG Project	Title	Mapped RE's within CSG Fields - PL171
Client	QGC - A BG Group business		
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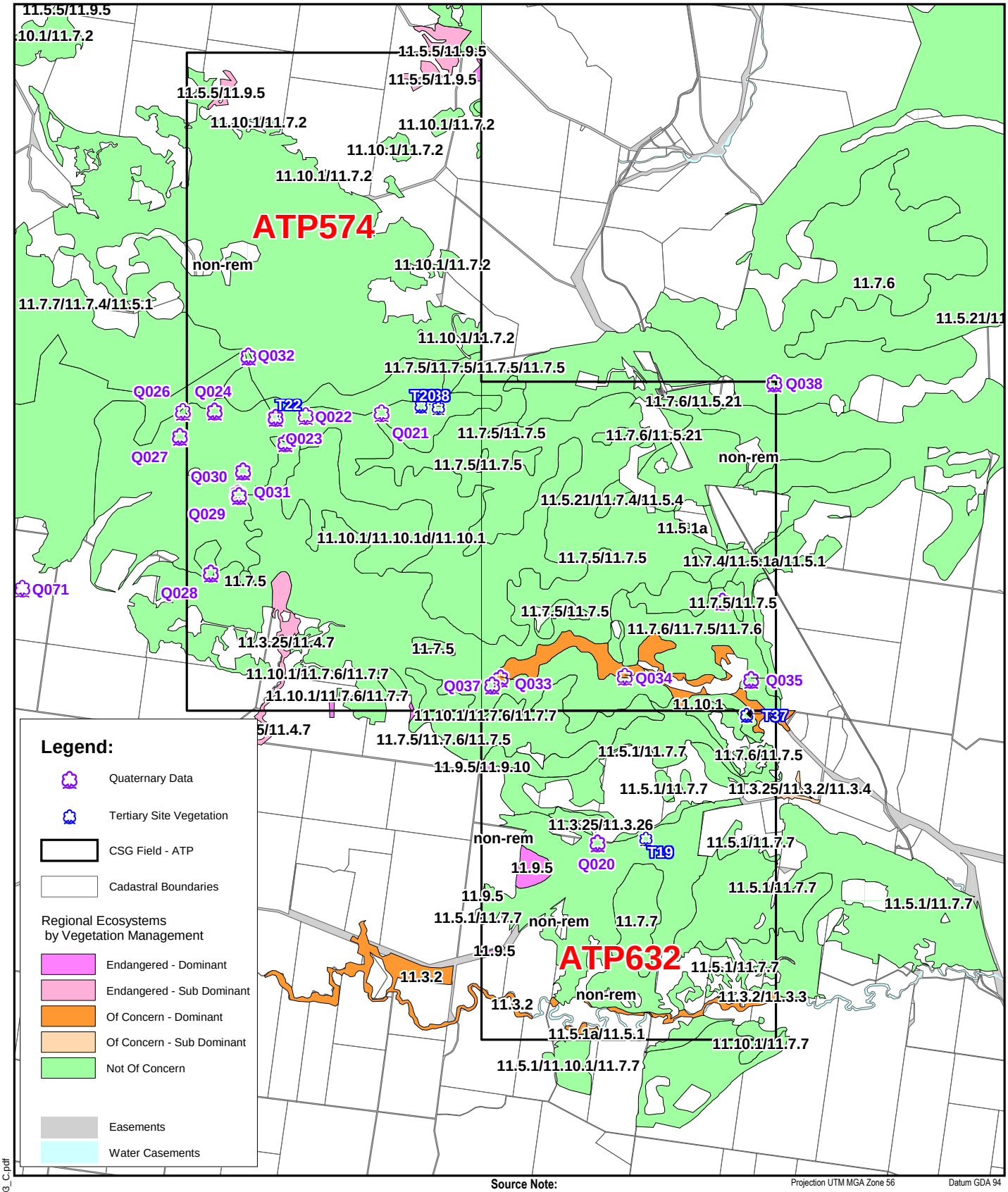

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Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Title	Mapped RE's within CSG Fields - ATP574 & ATP632

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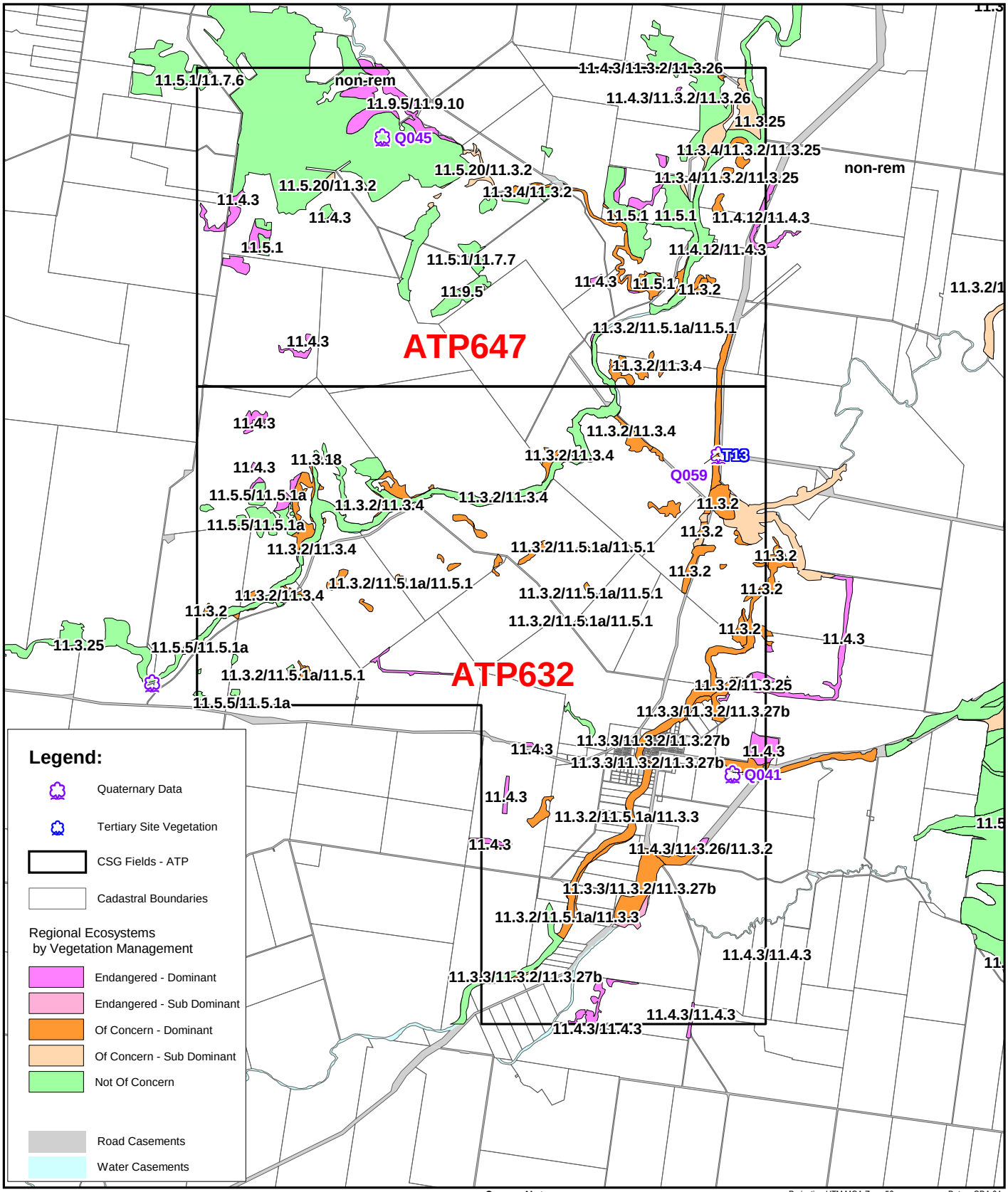

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QUEENSLAND CURTIS LNG
A BG Group business

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Project	Queensland Curtis LNG Project	Title	Mapped RE's within CSG Fields - ATP647 & ATP632
Client	QGC - A BG Group business		
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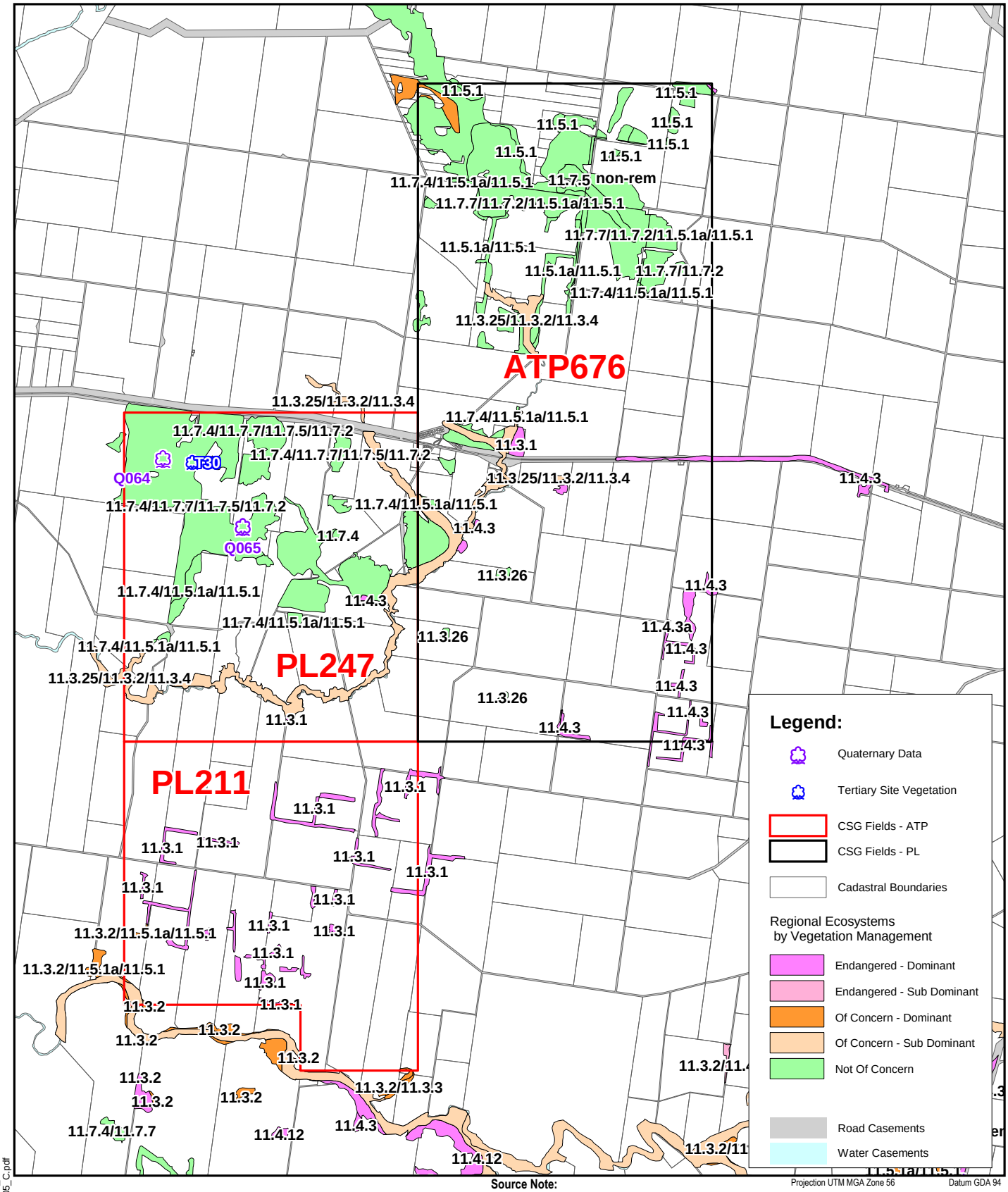

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within CSG Fields - ATP676, PL247 & PL211**

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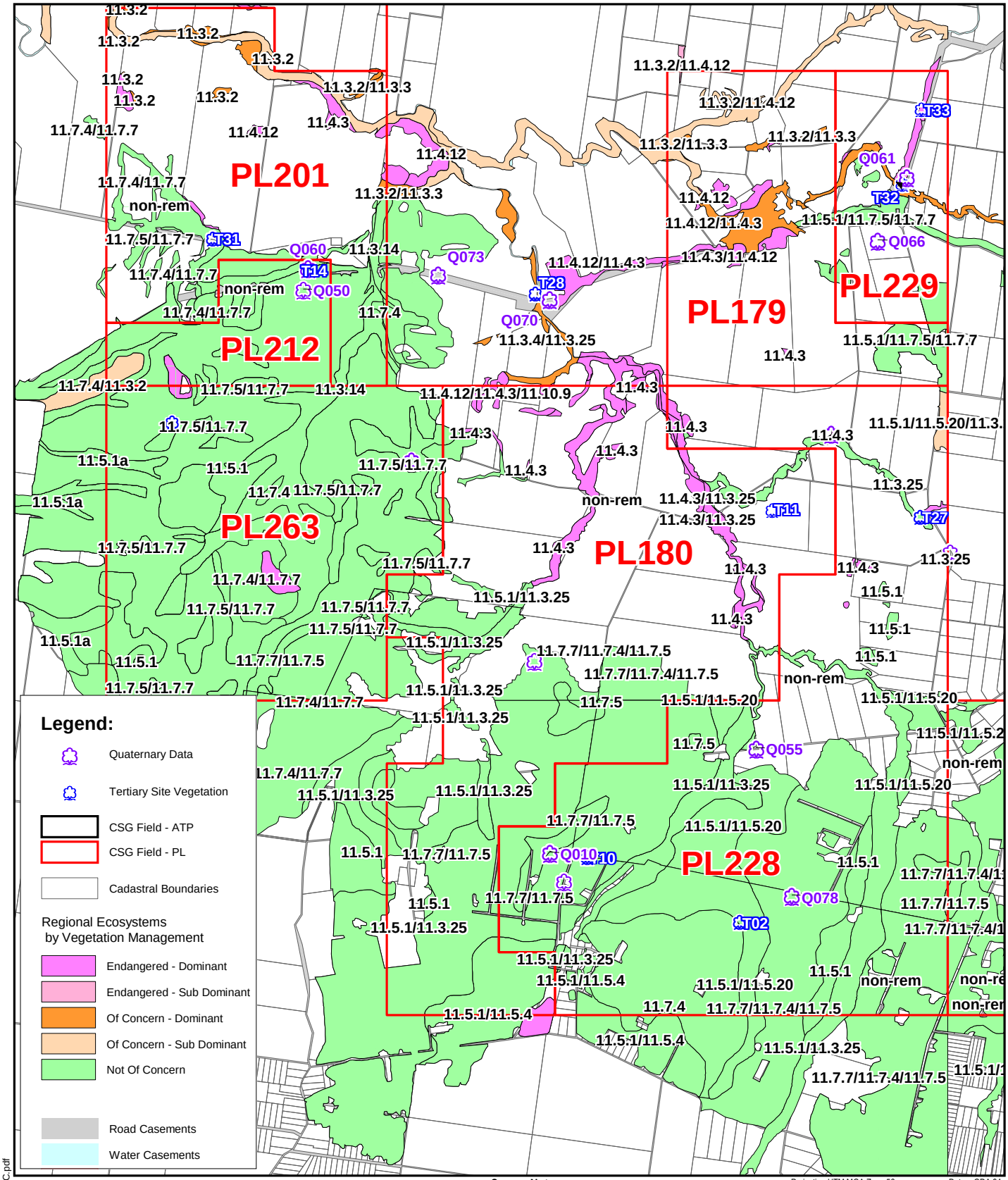

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Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title Mapped RE's within CSG Fields - PL201, PL212, PL263, PL180, PL179, PL229 & PL228

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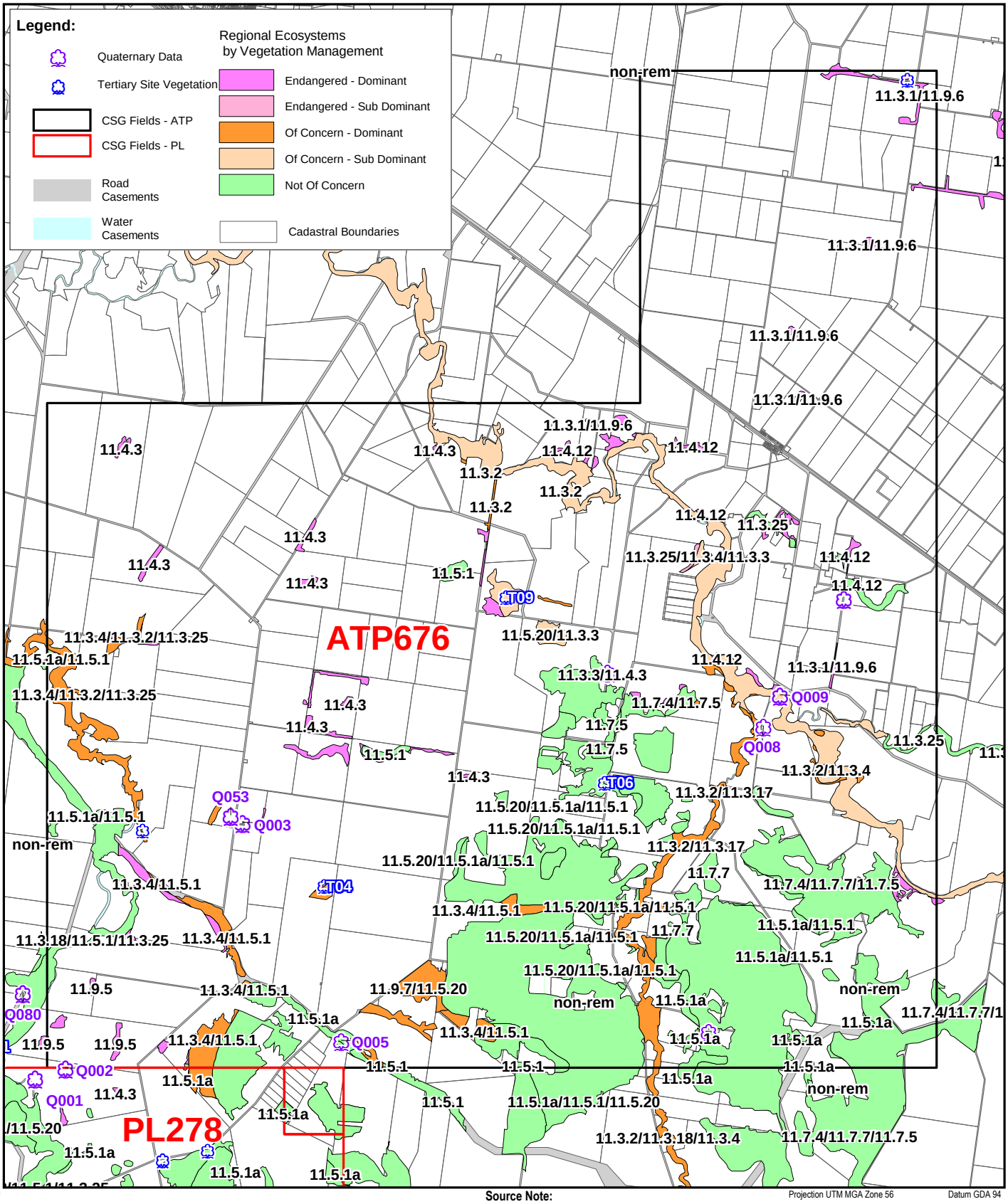

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Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Title	Mapped RE's within CSG Fields - ATP676

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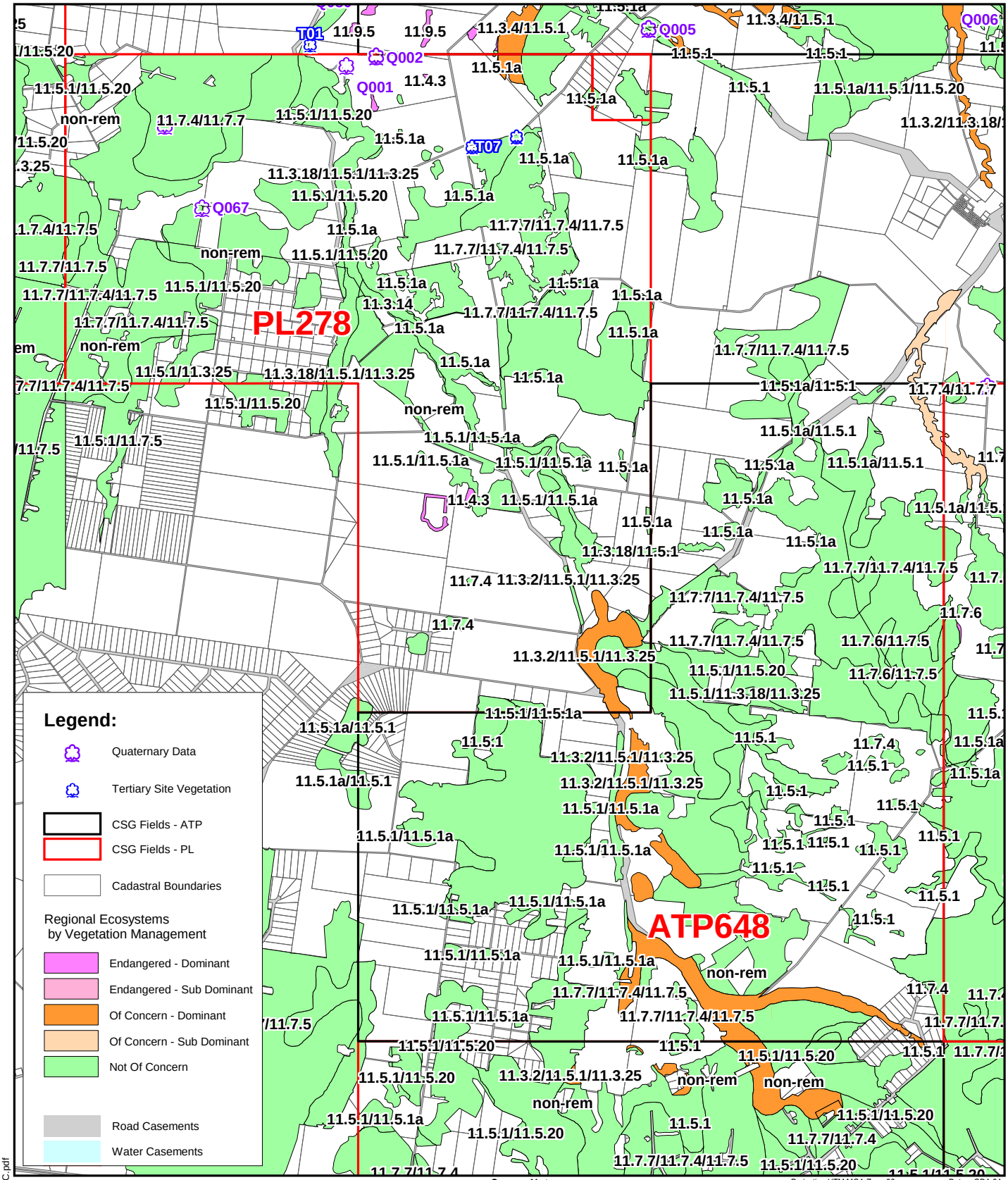

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0 1.5 3 4.5 6
Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within CSG Fields - ATP648 & PL278**

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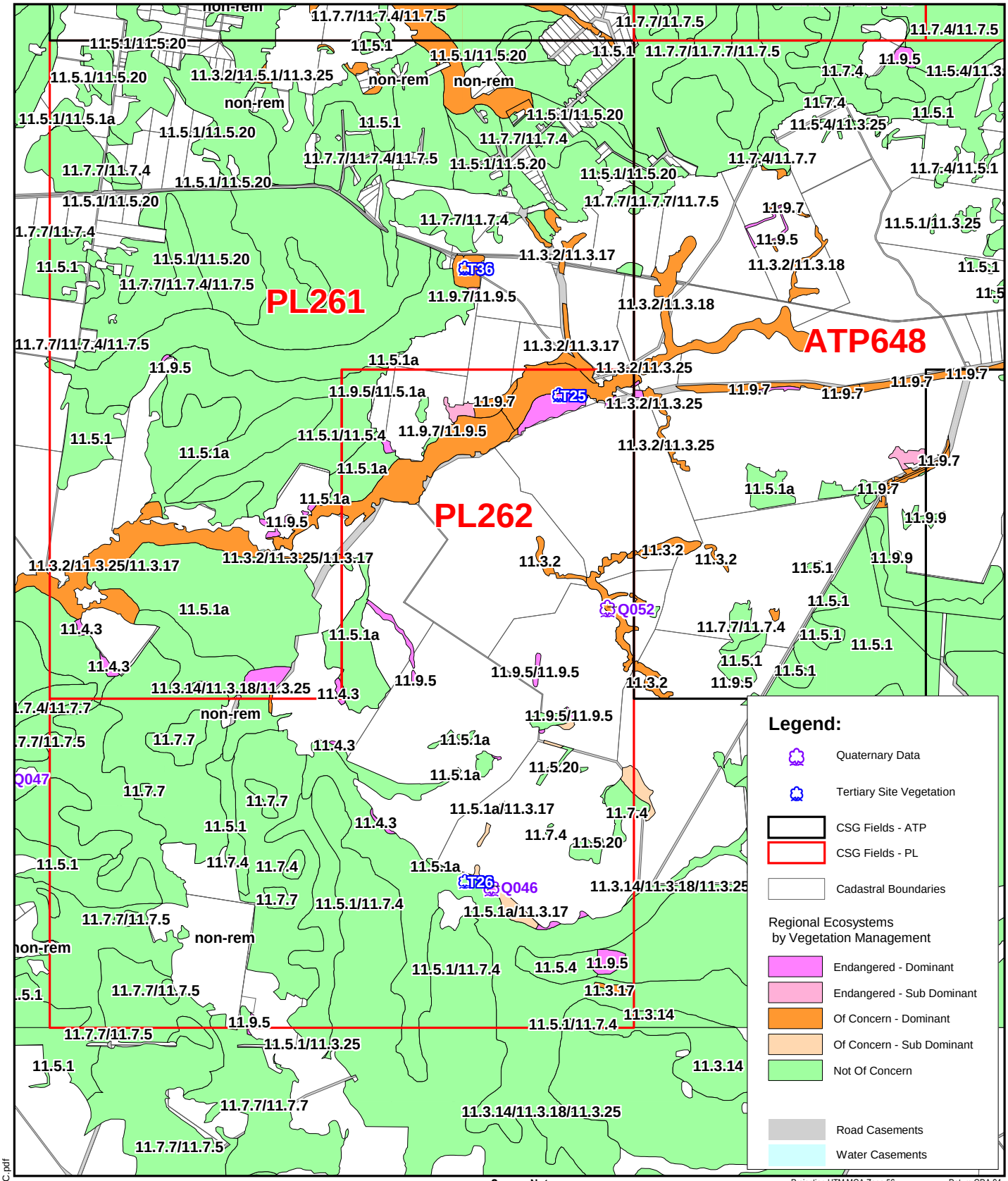

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0 1.5 3 4.5 6

Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within CSG Fields - ATP648, PL261 & PL262**

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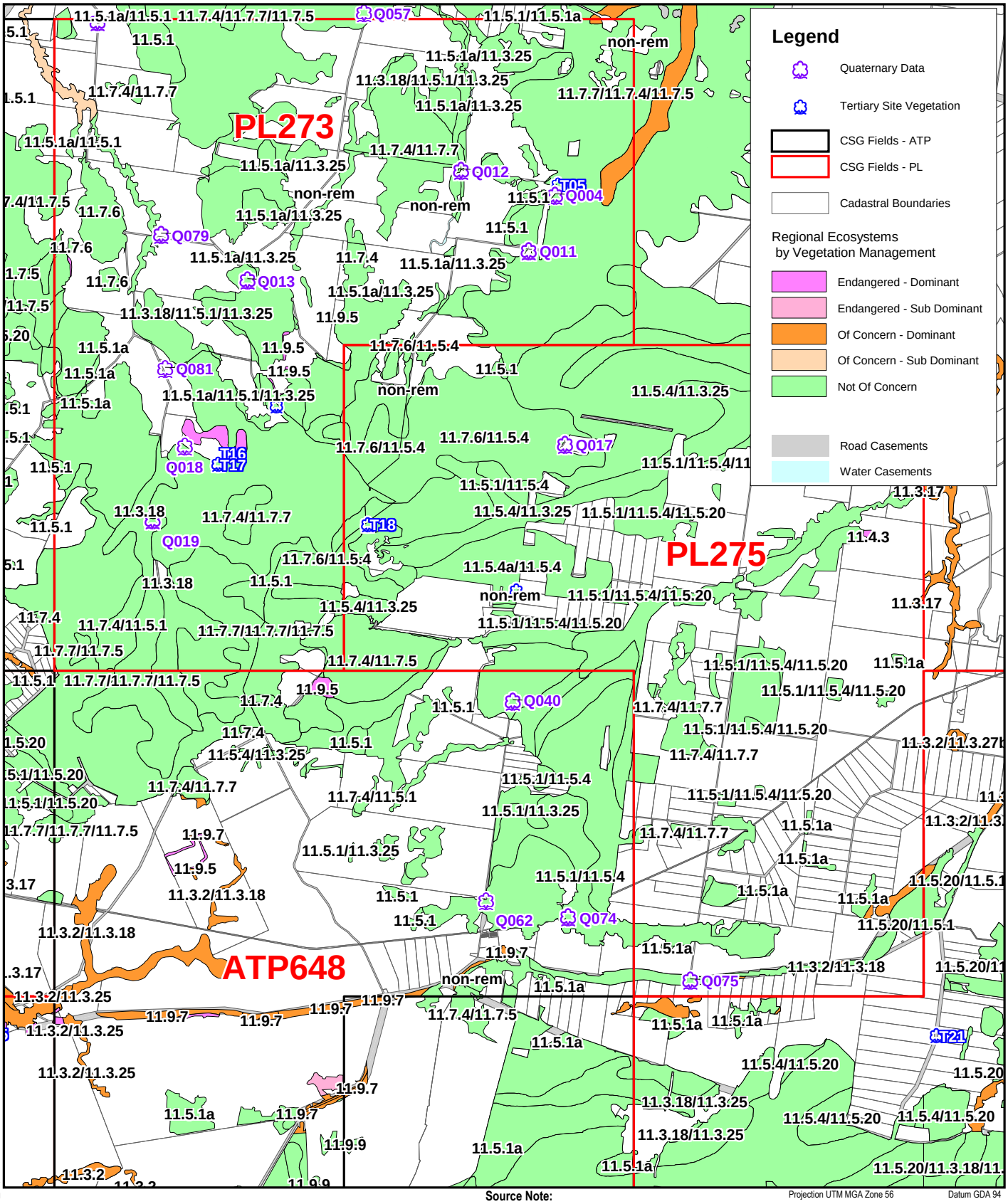

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Projection UTM MGA Zone 56 Datum GDA 94

0 1.5 3 4.5 6

Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within CSG Fields - ATP648, PL259 & PL269**

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Environmental Resources Management Australia Pty Ltd

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Date	25.02.09	Revision	A

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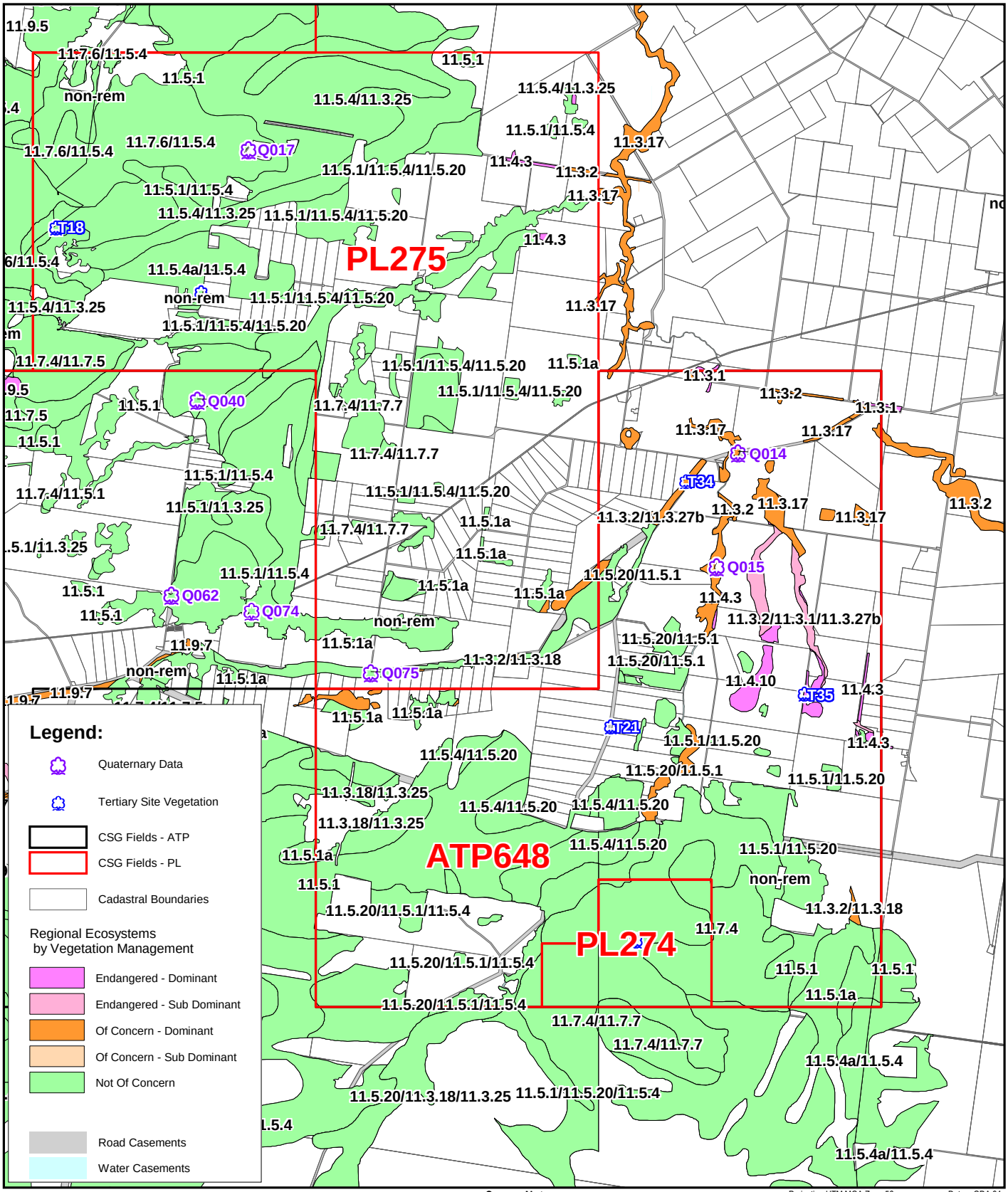

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Projection UTM MGA Zone 56 Datum GDA 94

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Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

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Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Drawn	DB
Approved	CDiP
Date	25.02.09
Figure	2l
File No:	
Revision	A

Title: **Mapped RE's within CSG Fields - ATP648 & PL269**

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- Review of the Draft Maranoa and Districts Regional Plan to identify areas recognised as having higher conservation values in relation to protection of the region's biodiversity and ecological processes (DIP 2008).

It is recognised that the information gained from these databases has caveats attached to it regarding the robustness or completeness of the information.

HERBRECS data is based almost exclusively on plant specimens that have been recorded as present in the given locations. The absence of any specimen records for a particular species from an area does not imply that that species does not occur in that area.

Data from the DEWHA EPBC Act website is based on a combination of actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics. The mapping of a particular species in a search area does not guarantee that the species actually occurs in that area.

5.1.3 Flora Field Assessment

Field surveys of the CSG Field were conducted between 17 July and 9 September 2008, and the 22 and 23 of January 2009, by Unidel Botanist, Ann Moran (CV provided in **Attachment 6**). Representative portions of the CSG Field were traversed by vehicle and / or foot.

The field surveys included:

- Investigation of the presence / absence or likely presence / absence of EVR flora species and communities identified in Commonwealth and State legislation
- Ground truthing of 126 sites through the CSG Field. Of these, 46 sites were detailed Tertiary level assessments and the remainder were assessed to Quaternary level. Quaternary assessments recorded dominant canopy species, while Tertiary assessments recorded an inventory of all woody flora species, their average height and their approximate abundance (including native and exotic flora species). Where possible, at least one Tertiary survey site was located within each RE type present in the CSG Field. Landowner access constraints prohibited surveys within some RE types. Tertiary assessments also included targeted searches for potential EVR and regionally significant flora species. Comprehensive flora species lists and detailed abundance data were not collected or considered necessary for the purposes of this assessment, and
- Observations on the wider environment of the CSG Field so that the potential impacts associated with proposed activities could be considered in the local, regional and State contexts.

The flora site surveys were in accordance with the Queensland Herbarium vegetation survey methods described in Neldner *et.al.* (2005). The following data was collected for the Tertiary sites:

- Confirmation of RE type
- General description of vegetation
- Structural characteristics of vegetation (based on life forms, approximate height and relative dominance)

- Groundcover characteristics
- Vegetation condition (integrity) as either pristine, excellent, very good, good, average, degraded or completely degraded
- Occurrence of weed species
- Dominant species in each structural component of the vegetation;
- Patch size and shape
- Landscape characteristics
- Soil characteristics, and
- Notes on particular sensitivities to the proposed impacts.

Locations of Tertiary and Quaternary sites are shown in **Figures 2a-l**.

GPS coordinates were taken using hand held GPS (accuracy +/- 10-20 m) to identify survey site locations and to assist in validating the existing Queensland Herbarium RE mapping. The general distributions of declared and other significant pest plants within the CSG Field were also noted.

5.2 Fauna Assessment

5.2.1 Determination of Significance Level

Listed EVR fauna are defined as those taxa listed in the EPBC Act as Critically Endangered, Endangered, Vulnerable or Conservation Dependant, and in the NC Act (1992) as Endangered, Vulnerable or Rare. This includes those species that have been given extra protection as Migratory and / or Marine Protected Species under the EPBC Act, but which are not EVR or Regionally Significant fauna.

For the purposes of this assessment Regionally Significant fauna species were defined non-EVR species categorised as BAMM Category H species EPA (2008c) and listed under various Action Plans. Relevant Action Plans consulted to determine status were: Sands and New (2000) for butterflies, Wager and Jackson (1993) for freshwater fishes, Tyler (1997) for frogs, Cogger *et al*. (1993) for reptiles, Garnett and Crowley (2000) for birds, Maxwell *et al*. (1996) for monotremes and marsupials, Duncan *et al*. (1999) for bats and Lee (1995) for rodents.

All other native fauna have been designated as Least Concern.

5.2.2 Fauna Desktop Assessment

The desktop study involved a review of published material and searches of relevant databases and archives. This assessment was used to document known records for the study area, identify the potential presence of significant fauna species and assist in targeting areas for field assessment. The desktop components undertaken included:

- Collection and review of existing EPA WildNet data, Birds Australia data, Queensland Museum data and EPBC Protected Matters Search for the area -25.8227°S to -27.435833 S and 149.4602°E to 151.1796°E
- Review of the Brigalow Belt South Biodiversity Planning Assessment (EPA 2008a) to identify areas that are recognised as State, Regional or Local

Biodiversity Significant or flagged as important for their integrated biodiversity values that are within close proximity to the project area

- Review of Queensland Herbarium RE mapping for the corridor to establish those vegetation communities mapped by the EPA at a scale of 1:100 000 as well as satellite imagery to gain an appreciation of potential fauna habitats and of the project's proximity to sensitive areas
- Review of the DERM Biodiversity Assessment and Mapping Methodology
- Review of the DERM Environmentally Sensitive Areas Mapping (ESAs)
- Review of the DERM Essential Habitat Areas Mapping, and
- Search of the Directory of Important Wetlands database.

The following texts were also reviewed: Barker *et al*. (1995), Cogger (2000), Duncan et al. (1999), Ehmann (1992), Garnett and Crowley (2002), Greer (2005), Menkhorst and Knight (2004), Morcombe (2003), Robinson (1998), Strahan (1995), Wilson (2005), Wilson and Swan (2003) and Wilson and Knowles (1988).

5.2.3 Fauna Habitat Mapping

All REs identified as present within the project area were stratified into broad Faunal Habitats, based on the classification of Major Vegetation Groups and Subgroups identified by the National Vegetation Information System (NVIS) framework, developed for the National Land and Water Resources Audit (NLWRA 2001). Information used to categorise REs into Habitats was drawn from the RE descriptions (including landforms) in Sattler and Williams (1999) and in version five of the *Regional Ecosystem Description Database* (EPA 2007), along with data from the *Australian Terrestrial Biodiversity Assessment 2002* (NLWRA 2002).

5.2.4 Fauna Field Assessment

Initial rapid assessments to appraise fauna habitat were conducted in conjunction with the Quaternary flora assessments as described in **Section 5.1.3** above. As for the flora, these surveys covered a range of landforms, land tenures and vegetation RE classifications.

Detailed fauna surveys were then carried out in the CSG Field from 27 October to 2 November, 12-18 November and 3-9 December 2008 by ecologist Bruce Thomson (CV provided in **Attachment 6**). In addition, surveys in other locations within the CSG Field were conducted during the week of the 24-28 October 2008.

The sites chosen for detailed fauna surveys were based on the analysis of the Quaternary assessments with the aim of surveying representative areas of intact native vegetation, since it was assumed that such areas would provide the best indication of fauna abundance and diversity. Similar criteria have been used to identify survey sites in other fauna survey projects (Pennay *et al*. 2002). Sites were also selected to minimize disturbance to livestock and property management activities, and also to reduce the likelihood of damage to survey equipment.

Three sites were selected for the detailed fauna survey. These were located in Braemar State Forest, Condamine State Forest and Gurulmundi State Forest

near Miles. In addition to the quaternary assessments, rural lands were also further assessed by day surveys from the 24-28 October 2008.

Fauna surveys were conducted using pit fall traps, bat traps, ultrasonic bat recording, remote cameras, observational bird transects and night spotlighting. Details of this trapping/observation effort are summarized in **Table 1** below.

Pit fall traps consisted of pvc tubes of approximately 25 cm in diameter and 45 cm deep. Two pit falls were placed in each sampling site along a plastic fence line 10 to 12 m long.

Ultrasonic bat recording was undertaken using a time expanded recording system from Binary Acoustic Technology (http://binaryacoustictech.com/) and was used as an adjunct to bat trapping with 3 bank harp traps supplied by FaunaTech (PO Box 1655, Bairnsdale, Victoria 3875).

Remote cameras were small Sony S600 digital cameras, activated by PIR sensors. The cameras were set to automatic and recorded fauna 24hrs a day.

Playback of Powerful Owl and Barking Owl calls was used during spotlight surveys in order to enhance detection of these species.

Fauna surveys were carried out under Ethics Approval CA 2008/08/294 and EPA Scientific Purposes Permit WISP05501608.

Table 1: Trapping/observation effort

Trapping/Observational Technique	Number of Traps/Observations per day	Total Trapping/Observational effort
Pit fall traps	16	288 pit fall days
Bat traps	3	63 bat trap nights
Bird transects	4 hrs	280 hrs
Spotlighting	2 hrs	42 hrs
Ultrasonic bat recording	0.5 hr	10.5 hrs
Camera Traps	6	216 trap days*

*Camera traps were set for a period longer than the duration of the main survey period.

5.3 Mapping of Environmentally Sensitive Areas

In order to evaluate the conservation significance of areas in the CSG Field the following data were overlaid using GIS layers:

- The BAMM methodology (the GIS product referred to as a Bioregional Planning Assessment)
- EPA's Environmentally Sensitive Areas
- Threatened Species and Ecological Communities (EPBC Act)
- Endangered REs (VM Act) (incorporated within BAMM Methodology)
- Of Concern REs (VM Act)
- Woodlands fringing drainage lines (RE 11.3.25)
- Wetlands (RE 11.3.27).

Numerical values were assigned to the criteria in order to allow the summation of an overall score (**Table 2**). In some cases where several BAMM criteria evaluated a number of co-dependant attributes, only one of these was used in the analysis in order to prevent double or triple scoring of essentially the same attribute. In the case of threatened species status, both Commonwealth and State values were used, since they are appraised through separate processes and thus may differ markedly. A table of attributes and the values used in the analysis is presented below.

The mapping derived from this process was used to identify Environmentally Sensitive Areas and formed the basis for the development of the constraints mapping presented in **Section 8** Mitigation and Rehabilitation Recommendations.

Table 2. Attributes and values used in the assessment of Environmentally Sensitive Areas

Attribute	Category	Value	Comments
EPA's Environmentally Sensitive Areas Mapping	A	2	
	B	1	
Threatened Ecological Communities		2	Identified through RE mapping units.
Threatened Species (EPBC Act)	Extinct	0	Extrapolated to the underlying RE polygon.
	Extinct in the wild	0	
	Crit. Endangered	4	
	Endangered	4	
	Vulnerable	3	
	Cons. Depend.	1	
	Not listed	0	
EVR Taxa (NC Act)	Extinct	0	
	Endangered	4	
	Vulnerable	4	
	Rare	1	
	Common	0	
BAMM Crit.A Habitat for EVR Taxa		4	
BAMM Crit.B Ecosystem Value (State)	Endangered	3	
	Of Concern	2	
	Not of concern	1	
	Non-remnant	0	
BAMM Crit.C Tract Size	Very High	4	
	High	3	
	Medium	2	
	Low	1	
	0	0	
BAMM Crit.D Rel. Size of RE (State)	Very High	4	
	High	3	
	Medium	2	
	Low	1	
BAMM Crit.E Condition		-	Not used.

BAMM Crit.F Ecosystem Diversity	Very High	4	
	High	3	
	Medium	2	
	Low	1	
BAMM Crit.G Context & Connection	Very High	4	
	High	3	
	Medium	2	
	Low	1	
	0	0	
BAMM Crit.H Habitat for Priority Taxa		2	Extrapolated to the underlying RE polygon.
BAMM Crit.I Special Biodiversity Values		2	
BAMM Crit.J Corridors		-	Represented in the values by Crit. C and G.
BAMM Crit.K Threatening Processes		-	Not used.

6.0 EXISTING ENVIRONMENT

6.1 Floral environment

The CSG Field encompass cleared grazing and cropping lands, roadside and travelling stock reserves, council lands, state forests and resource reserves.

Based on the Queensland Herbarium RE mapping, approximately 297,445 ha of the total 468,700 ha CSG Field area is cleared. The remnant vegetation in the CSG Field equates to 171,255 ha and consists of approximately:

- 149,414 ha of Eucalypt woodlands
- 975 ha of Acacia woodlands
- 3,617 ha of Brigalow / Belah woodland
- 621 ha of Semi-evergreen Vine Thicket
- 6,693 ha of riparian Eucalypt woodland
- 9,824 ha of shrubland on scalds, and
- 111 ha of wetlands.

6.1.1 Ecological Communities and Regional Ecosystems

The Queensland Herbarium RE mapping indentifies 34 REs occurring within the CSG Field, (**Figure 2a-l**, **Table 3**). **Table 3** also shows the area of each RE which, based on the existing Queensland Herbarium RE mapping, occurs:

- Within the CSG Field
- Within a 200 km by 200 km square centred on the CSG Field, and
- Within the Brigalow Belt Bioregion.

Field inspections generally agreed with RE mapping, although discrepancies were not infrequent and could not always be attributed to mapping scale. Field surveys assessed vegetation across the CSG Field, so were capable of detecting much smaller scale vegetation patterns than the Queensland Herbarium's 1:100 000 RE mapping. Field inspections also recorded clearing that had occurred post compilation of the most recent Queensland Herbarium RE mapping.

Locations of Tertiary and Quarternary sites are shown in **Figures 2a-l**. The Tertiary flora assessment data sheets are included in **Attachment 7**.

Table 3: Ecological Communities / REs Within the CSG Field

Ecological Communities / RE		Status*		Area within CSG Field (ha)†	Sites	Area within 200*200km sq (ha) †	% within 200*200km sq	Area within Bioregion (ha†)	% within Bioregion
RE	Description	VM	EPBC						
RE 11.3.1	*Acacia harpophylla* and / or *Casuarina cristata* open forest on alluvial plains	E	E	461	T8,T9,T11, T25,T26	3,668	12.6%	77,207	0.6%
RE 11.3.2	*Eucalyptus populnea* woodland on alluvial plains	OC	-	4,322	T3,T13, T28,Q19, Q49,Q70,Q 73,Q82,Q8 5	32,494	13.26	3,141,616	0.1%
RE 11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	OC	-	442	Not accessible	6,067	7.29	2,064,381	<0.1%
RE 11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains	OC	-	1,363	T1,T3,T4, Q33,Q46	8,137	16.72	4,609,681	<0.1%
RE 11.3.14	*Eucalyptus* spp., *Angophora* spp., *Callitris* spp. woodland on alluvial plains.	NOC	-	3,293	T14,Q60	17,721	18.6%	80,993	4.1%
RE 11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains	OC	-	229	T34	2,055	11.2%	36,892	0.6%
RE 11.3.18	*Eucalyptus populnea*, *Callitris glaucophylla*, *Allocasuarina luehmannii* shrubby woodland on alluvium	NOC	-	1,839	Not accessible	8,586	21.4%	82,220	2.2%
RE 11.3.19	*Callitris glaucophylla*, *Corymbia* spp. and/or *Eucalyptus melanophloia* open-forest to woodland on Cainozoic alluvial plains	NOC	-	13	T41	4,515	0.3%	93,392	<0.1%
RE 11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	NOC	-	6,693	T27,Q9, Q12, Q15,Q49Q 72,Q84	42,292	15.8%	488,209	1.4%
RE 11.3.26	*Eucalyptus moluccana* or *E. microcarpa* woodland to open forest on margins of alluvial plains	NOC	-	73	T4	12,039	0.6%	44,680	0.2%
RE 11.3.27	Freshwater wetlands	NOC	-	111	Not accessible*	1,130	9.8%	30,124	0.4%

Ecological Communities / RE		Status*		Area within CSG Field (ha)†	Sites	Area within 200*200km sq (ha) †	% within 200*200km sq	Area within Bioregion (ha†)	% within Bioregion
RE	Description	VM	EPBC						
					*				
RE 11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	E	E	1,570	T33, T43, Q2, Q3, Q16, Q41	28,822	5.4%	76,888	2.0%
RE 11.4.7	Open forest to woodland of *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* on Cainozoic clay plains	E	E	11	Not accessible	3,576	0.3%	20,847	0.1%
RE 11.4.10	*Eucalyptus populnea* or *E. pilligaensis*, *Acacia harpophylla*, *Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	E	E	193	T35	955	20.16	44,249	0.4%
RE 11.4.12	*Eucalyptus populnea* woodland on Cainozoic clay plains	E	-	384	T32,Q61	3,060	12.55	39,780	0.7%
RE 11.5.1	*Eucalyptus crebra*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces	NOC	-	46,223	T1,T2,T6, T7,T18,T19 ,T21,T23,T 29, Q17, T38, Q39, Q40, Q45, Q66, Q69, Q74, Q75, Q86, Q87	293,382	15.8%	482,867	9.6%
RE 11.5.4	*Eucalyptus crebra*, *Callitris glaucophylla*, *C. endlicheri*, *E. chloroclada*, *Angophora leiocarpa* on Cainozoic sand plains/remnant surfaces. Deep sands	NOC	-	6,083	T12,T15,T1 6,T18	45,405	13.4%	109,278	5.6%
RE 11.5.5	*Eucalyptus melanophloia*, *Callitris glaucophylla* woodland on Cainozoic sand plains/remnant surfaces. Deep red sands	NOC	-	481	Not accessible	43,475	1.1%	134,879	0.4%
RE 11.5.20	*Eucalyptus moluccana* and/or *E. microcarpa/ E. pilligaensis* ± *E. crebra* woodland on Cainozoic sand plains	NOC	-	5,196	T9,Q67	48,910	10.6%	154,248	3.4%
RE 11.5.21	*Corymbia bloxsomei* ± *Callitris*	NOC	-	512	Not	72,274	0.7%	72,274	0.7%

Ecological Communities / RE		Status*		Area within CSG Field (ha)†	Sites	Area within 200*200km sq (ha) †	% within 200*200km sq	Area within Bioregion (ha†)	% within Bioregion
RE	Description	VM	EPBC						
	glaucophylla ± *Eucalyptus crebra* ± *Angophora leiocarpa* woodland on Cainozoic sand plains/remnant surfaces				accessible				
RE 11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	NOC	-	966	Not accessible	20,580	4.7%	374,753	0.3%
RE 11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* on Cainozoic lateritic duricrust	NOC	-	31,156	T24, T38, Q6, Q21, Q44, Q51, Q62, Q68	133,499	23.3%	226,998	13.7%
RE 11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	NOC	-	9,824	T5,T10,T20 ,T22,T30,T 31,,Q47, Q64, Q78	30,782	31.9%	63,554	15.5%
RE 11.7.6	*Corymbia citriodora* or *Eucalyptus crebra* woodland on Cainozoic lateritic duricrust	NOC	-	10,294	T12,T16, Q13, Q22, Q24, Q29, Q32, Q36, Q81	148,735	6.9%	344,575	3.0%
RE 11.7.7	*Eucalyptus fibrosa* subsp. *nubila* ± *Corymbia* spp. ± *Eucalyptus* spp. on Cainozoic lateritic duricrust	NOC	-	25,212	T5,T19,T24 , Q4, Q10, Q20, Q47, Q55, 56, Q57, Q58, Q65	101,196	24.9%	172,437	14.6%
RE 11.8.3	Semi-evergreen vine thicket on Cainozoic igneous rocks. Steep hillsides	NOC	E	8	Not accessible **	526	1.5%	26,482	0.0%
RE 11.9.4	Semi-evergreen vine thicket or *Acacia harpophylla* with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks	E	E	613	T44, Q18	5,127	12.0%	56,888	1.1%
RE 11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	E	E	1,175	T17, T39, T45, Q1, Q37, Q42	15,205	7.7%	145,844	0.8%
RE 11.9.6	*Acacia melvillei* ± *A. harpophylla* open	E	E	9	Not	279	3.1%	378	2.3%

Ecological Communities / RE		Status*		Area within CSG Field (ha)†	Sites	Area within 200*200km sq (ha) †	% within 200*200km sq	Area within Bioregion (ha†)	% within Bioregion
RE	Description	VM	EPBC						
	forest on fine-grained sedimentary rocks				accessible **				
RE 11.9.7	*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	OC	-	637	T36	7,171	8.9%	108,832	0.6%
RE 11.9.9	*Eucalyptus crebra* woodland on fine-grained sedimentary rocks	NOC	-	179	Not accessible	1,628	11.0%	122,812	0.1%
RE 11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	OC	-	411	Not accessible	3,076	13.4%	84,260	0.5%
RE 11.10.1	*Corymbia citriodora* open forest on coarse-grained sedimentary rocks	NOC	-	10,402	T37, Q71, Q83	76,463	13.6%	886,060	1.2%
RE 11.10.9	*Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	NOC	-	877	Q8, Q43	21,843	4.0%	391,293	0.2%

* E = Endangered under both EPBC Act and VM Act; OC = Of Concern; N = Not of Concern under the VM Act
^ Not accessible and recommended “No Go” areas based on values and sensitivities.
†Approximate based on existing Queensland Herbarium Mapping

6.1.2 EPBC Act Listed Ecological Communities

The CSG Field contains two threatened Ecological Communities listed as Endangered under the EPBC Act (**Table 3**). These are represented by eight Regional Ecosystems as described, namely:

- Brigalow woodland / open forest communities – REs 11.3.1, 11.4.3, 11.4.7, 11.4.10, 11.9.5, and 11.9.6, and
- Semi-evergreen vine thicket communities – RE 11.8.3 and RE 11.9.4.

The six Brigalow communities occur on fertile soils within areas predominantly cleared of remnant vegetation throughout the CSG Field. The Brigalow remnants are almost always small and narrow fragments which have been left along fencelines, creeks and roadsides. Two slightly larger patches occur in north-western areas of the CSG Field in Cherwondah State Forest (i.e., PL171; **Figure 3**). The small patches were generally found to be degraded due to edge effects including weed invasion and fire damage. Small patches of Brigalow, of relatively high quality were observed in Braemar and Condamine State Forests.

According to Queensland Herbarium mapping the REs 11.4.3 and 11.9.6 have an area within the CSG Field that equates to at least 2% of that type of RE found within the bioregion.

Field surveys verified the occurrence of a mapped RE 11.4.3 remnant (T33). It was found to be in a degraded condition due to edge effects such as weed invasion. The total area of RE 11.4.3 found within the CSG Field is approximately 1,570ha, this equates to approximately 2% of this type of RE found within the bioregion.

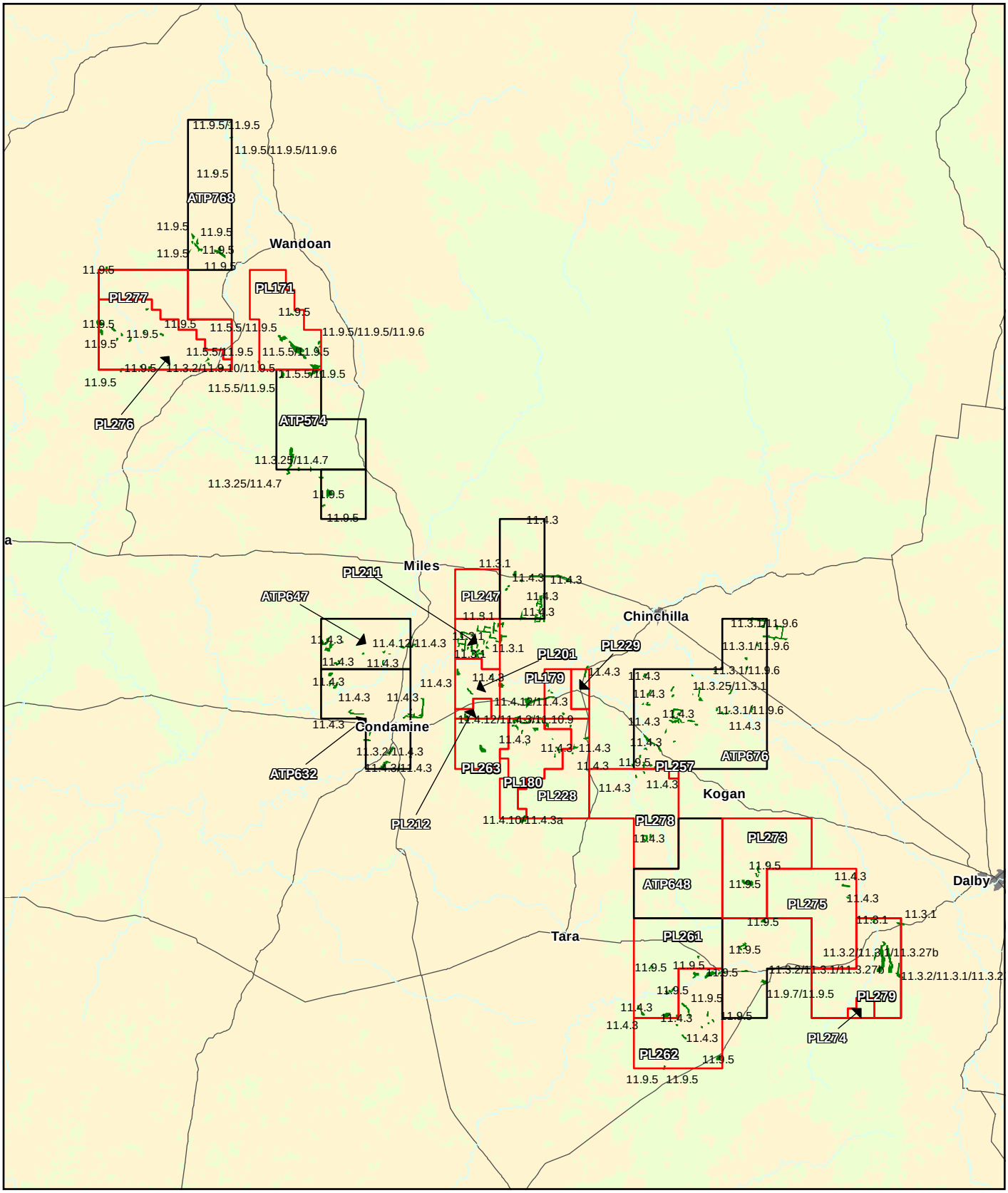
The total area of RE 11.9.6 located within the CSG Field is mapped as approximately 9 ha, which equates to 2.2% of this type of RE found within the bioregion.

According to existing maps the areas of REs 11.3.1, 11.4.1, 11.4.7, 11.4.10, 11.9.5 found within the CSG Field equate to less that 1% of that which occurs in the bioregion. With the exception of RE 11.4.7, the presence of all of these REs were verified during the field surveys (T8, T9, T11, T17, T25, T26, T35, T39, T45). The condition of these areas was found to vary from degraded to very good. Two sites deemed to be in very good condition occurred within roadside remnants of RE 11.3.1 (T25 and T26). These remnants contained low numbers of weed species. Two remnants of RE 11.9.5 (T39 and T45) were surveyed and found to be degraded due to past land practices such as grazing and logging.

The SEVT communities occur on deep red soils with clay subsoil and are confined to the northern part of the CSG Field (i.e. ATP651 and PL171). The SEVT remnants are typically small fragmented patches, although two larger ones occur north of ATP651 as illustrated in **Figure 4**. The small patches are degraded by edge effects including weed invasion and fire damage.

Due to access constraints no areas of the RE 11.8.3 (8 ha in total) were assessed during the field surveys. In this case the Herbarium mapping is assumed to be correct. The area of RE 11.8.3 mapped as occurring within the CSG Field is estimated to be 1.1% of that which occurs within the bioregion.

Field surveys of a mapped remnant of RE 11.9.4 found the area to be highly degraded due to habitat fragmentation and the presence of environmental weeds such as Buffel Grass (*Cenchrus ciliaris*). The total area of RE 11.9.4 found within



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Brigalow Communities

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
Regional Ecosystem v5.0 copyright Queensland Herbarium

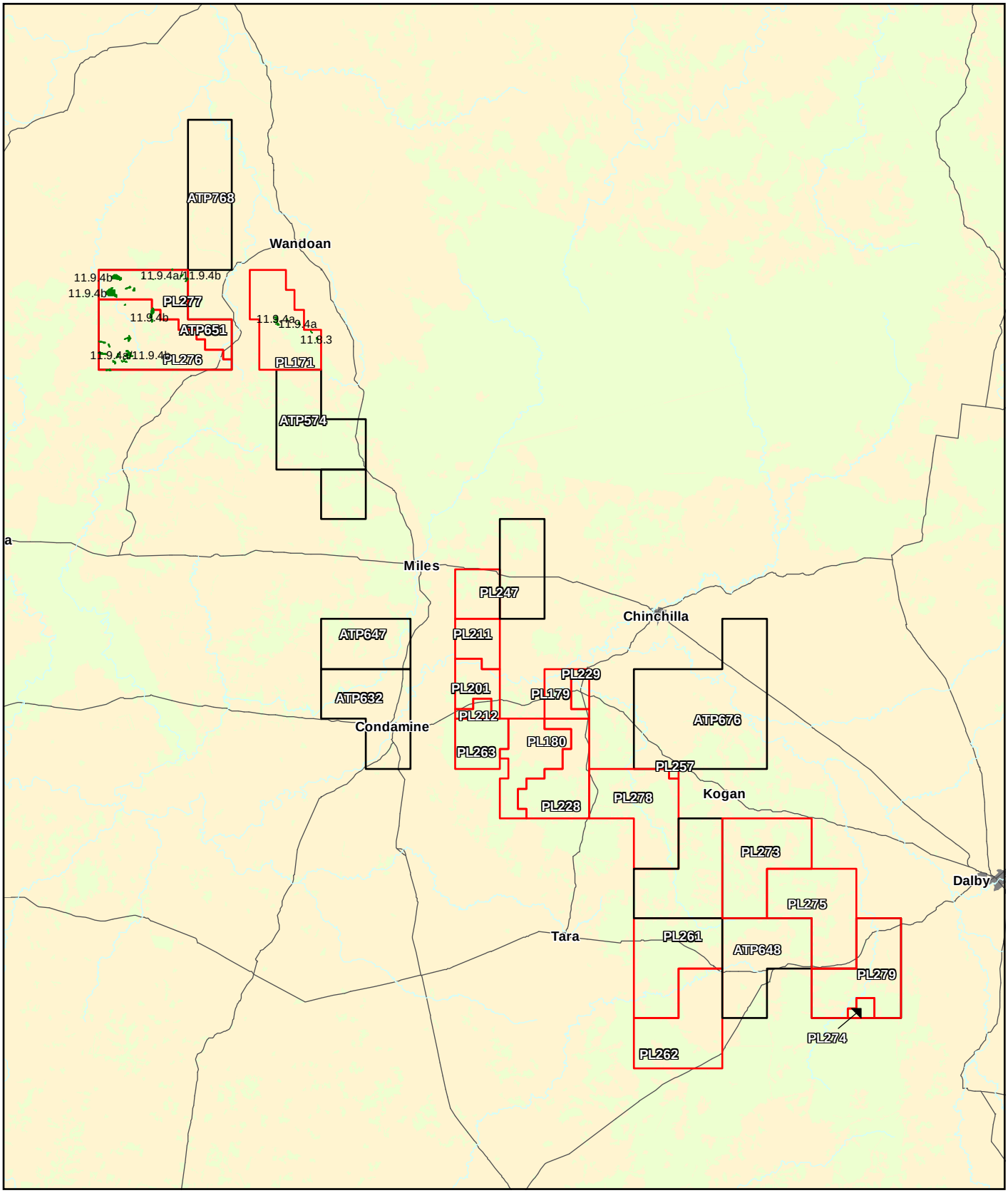
Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Brigalow Woodland / Open Forest Communities**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: xx	Figure: 3	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: xx	File No: QC02-T-MA-0032	
	Date: 25.02.09	Revision: A	



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Semi-evergreen vine thicket communities

Source Note:

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Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project	Title	Semi-evergreen vine thicket communities
Client	QGC - A BG Group business		
Drawn xx	Figure 4		
Approved xx	File No: QC02-T-MA-0033		
Date 25.02.09	Revision A		

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the CSG Field is approximately 613 ha. This equates to approximately 1.1% of this RE type found within the bioregion.

An additional Threatened Ecological Community which may occur within the CSG Field is the Endangered Weeping Myall Open Woodland Community. This Community is not mapped by the Queensland Herbarium RE mapping nor was it detected by the initial field studies. However, it is described by DEWHA (2008) as occurring within the Brigalow South Bioregion, generally in small patches of alluvial soils within REs 11.3.2 and 11.3.28. As such, it may potentially occur in alluvial areas within the CSG Field.

Other EPBC Act Listed communities identified as potentially present by the EPBC database includes Endangered Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South) The existing Queensland Herbarium RE mapping indicates that no remnant of this Ecological Community occurs within the CSG Field. Likewise, the field surveys failed to locate this community.

The proportion of each of the Brigalow and SEVT REs which occur within the CSG Field is less than 13% of that found in a 200 km x 200 km area centred on the CSG Field and less than 2.4% of that found in the Bioregion. An exception to this is RE 11.4.10 for which the area contained in the CSG Field represents approximately 20% of that which occurs in the broader 200 km x 200 km buffer.

6.1.3 VM Act Endangered REs

All of the six EPBC Act listed Brigalow REs that occur in the CSG Field are also listed as Endangered under the VM Act. The RE 11.9.4 (SEVT) mapped as present in the CSG Field is also listed as Endangered under the VM Act. As such, the above discussion also applies to these REs.

In addition to these seven REs, the CSG Field contains one RE that is listed as Endangered under the VM Act only (RE 11.4.12 - *Eucalyptus populnea* woodland on Cainozoic clay plains). Only a few small patches of this RE occur within the central part of the CSG Field (**Figure 5**).

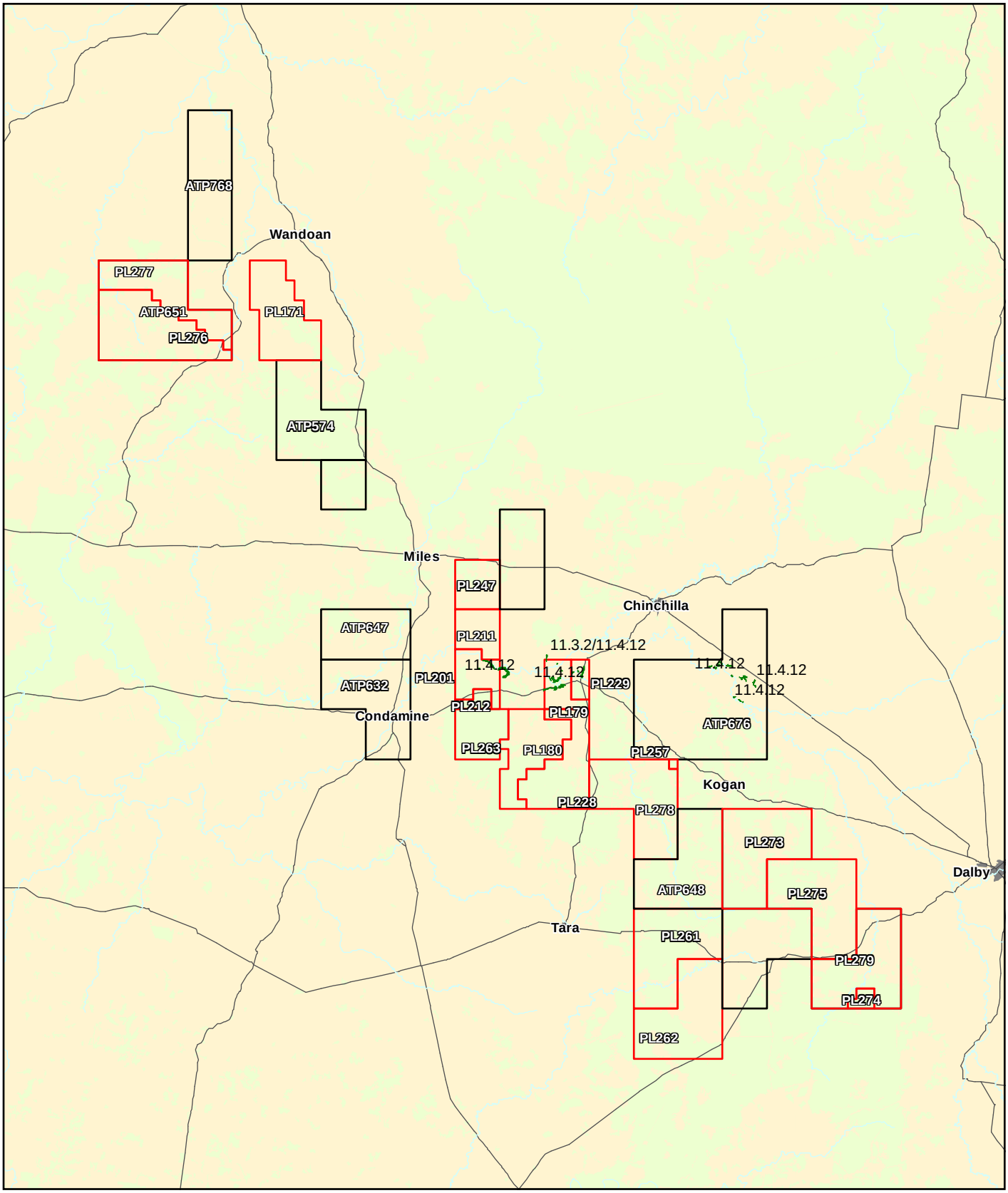
Field surveys of one these mapped fragments (T32), found the community to be in a degraded condition as a result of edge effects such as weed invasion. The declared weed species Prickly Pear (*Opuntia tomentosa*) and Mother of millions (*Bryphyllum delagoense*), and the environmental weed Buffel Grass (*Cenchrus ciliaris*) were observed on the site.

The area of RE 11.4.12 which occurs within the CSG Field is approximately 384 ha. This equates to approximately 12.5% of that found in a 200 km x 200 km area centred on the CSG Field and less than 1% of that which occurs in the Bioregion.

6.1.4 VM Act Of Concern REs

Six Of Concern REs occur within the CSG Field (i.e. REs 11.3.2, 11.3.3, 11.3.4, 11.3.17, 11.9.7, and 11.9.10; **Table 3**). These are all Eucalypt woodland communities and occur in thin long patches throughout the CSG Field (**Figure 6**). According to Herbarium mapping the area of these REs found within the CSG Field is a small proportion of that which is found in the Bioregion (i.e. <1%).

Field surveys verified the presence of these mapped REs at six locations (T1, T3, T13 T34, T37, T28). Field surveys discovered one discrepancy when a remnant mapped as the mixed community RE 11.3.4/11.5.1 was found it in reality to be the



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Eucalyptus populnea woodland on Cainozoic clay plains

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Eucalyptus populnea woodland on Cainozoic clay plains
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: xx	Figure: 5	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
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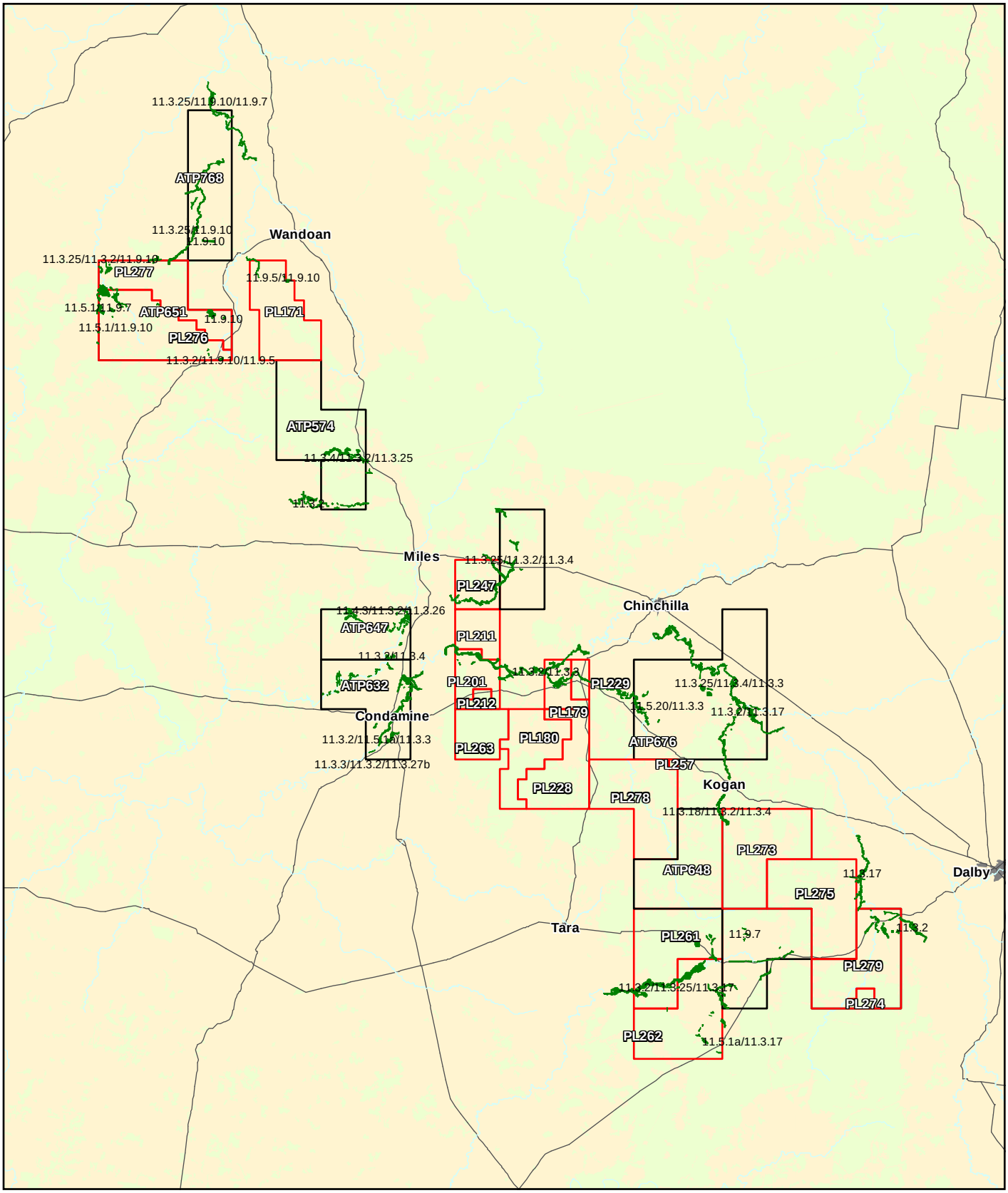
	Date: 25.02.09	Revision: A	



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Of Concern RE's

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
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Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Of Concern RE's
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: GH	Figure: 6	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: xx	File No: QC02-T-MA-0035	
	Date: 25.02.09	Revision: A	

Not of Concern community RE 11.3.26. Due to land access and time constraints the REs 11.3.3 and 11.9.7 were not assessed. In these cases the Herbarium mapping is assumed to be accurate.

The Eucalypt woodland communities assessed varied from degraded to very good condition. The community considered to be in a very good condition (T28) was a fragment of RE 11.3.2 found within the Wieambilla Creek area. This area was found to have minimal weed species present and provides potential habitat for the EVR species *Acacia wardellii*. Remnants of REs 11.3.2 (T13) and 11.3.17 (T34) were found to be degraded as a result of edge effects such as weed invasion. The declared weed Prickly Pear (*Opuntia tomentosa*) and environmental weed Buffel grass (*Cenchrus ciliaris*) were observed on both sites.

The proportion of each of these Eucalypt Woodlands which occurs within the CSG Field represents less than 17% of that found in a 200 km x 200 km area centred on the CSG Field and less than 1% of that found in the Bioregion.

6.1.5 VM Act Not Of Concern REs

Desktop study results show 20 REs listed as Not Of Concern, under the VM Act, occurring within the CSG Field. These are:

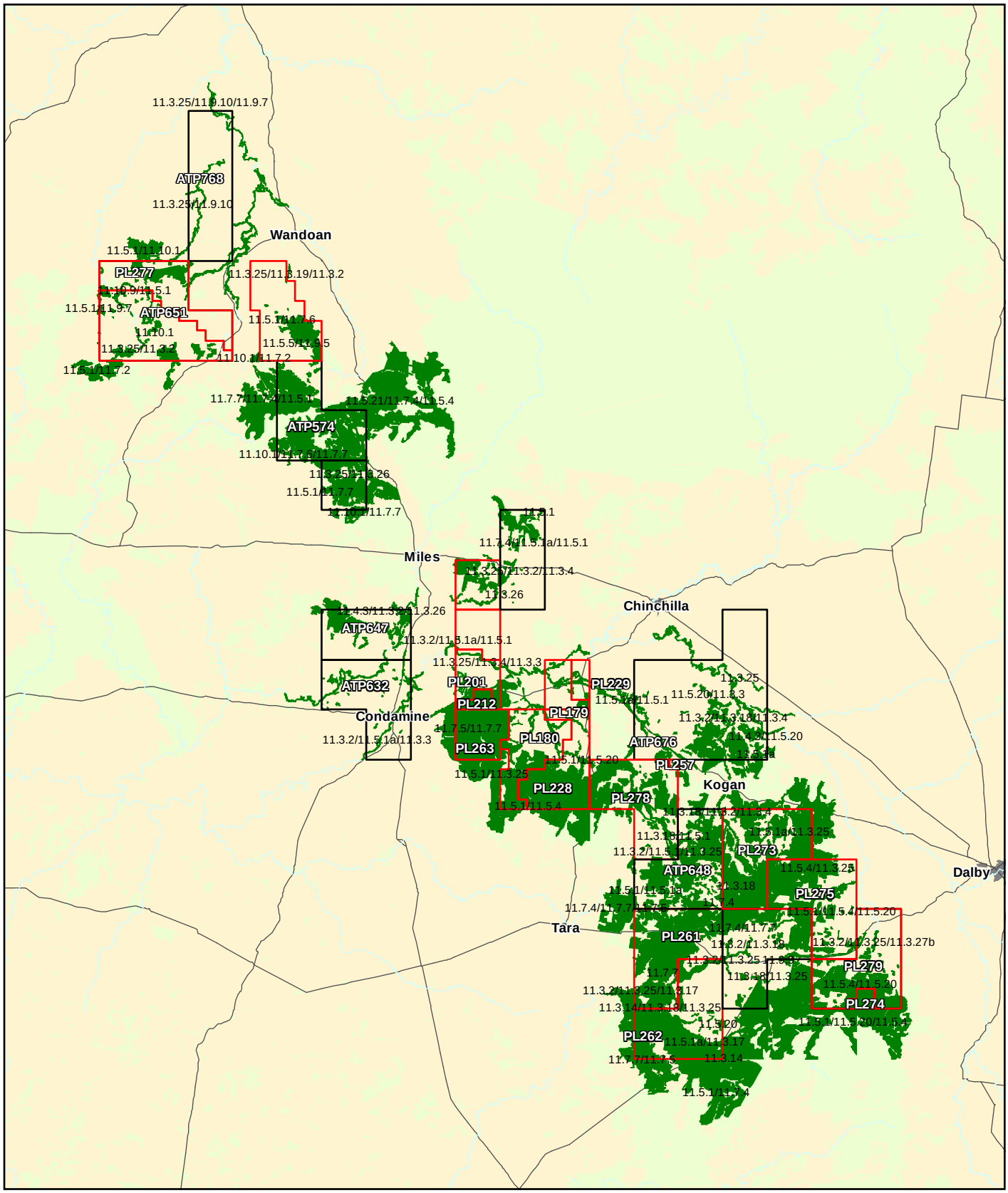
- 15 Eucalypt woodland communities – REs 11.3.14, 11.3.18, 11.3.19, 11.3.26, 11.5.1, 11.5.4, 11.5.5, 11.5.20, 11.5.21, 11.7.4, 11.7.6, 11.7.7, 11.10.1, 11.9.9, and 11.10.9
- 1 Riparian woodland community – RE 11.3.25
- 1 Freshwater wetland community – RE 11.3.27
- 1 Shrubland community – RE 11.7.5
- 1 Acacia woodland community – RE 11.7.2, and
- 1 Semi-evergreen vine thicket community – RE 11.8.3.

Eucalypt woodlands occur in 12 of the 46 Tertiary sites surveyed. They occur throughout the CSG Field in large interconnected patches (**Figure 7**) and are generally in average (i.e. T2, T6, T6, T29) to very good condition (i.e. T1, T18, T19, T23, T24).

These Eucalypt woodlands are generally well represented outside of the CSG Field. However, a relatively significant proportion of the three, REs 11.5.1, 11.7.4 and 11.7.7, is contained within the CSG Field. The area of these REs within the CSG Field in comparison to what occurs in the bioregion is 9.6%; 13.7% and 14.6% respectively.

Field surveys were conducted in RE 11.5.1 at seven locations (T2, T6, T7, T18, T19, T23, T29). The surveys encountered one discrepancy where an area mapped as RE 11.5.1 was in fact a non-remnant due to past clearing in the area (T21).These fragments were in degraded to very good condition. A remnant in very good condition was that of the mixed community RE 11.5.4/11.5.1 located within the Braemar State Forest (T18). Although this site was found to contain few weed species, of the weeds that were present, one was the declared weed Prickly Pear (*Opuntia tomentosa*).

Of the four mapped RE 11.7.4 remnants visited during the field surveys only one was found to show characteristics of the RE 11.7.4 (T24). This site (T24) was found to be a mixed community of RE 11.7.4/11.7.7 in very good condition. This



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Not of Concern Eucalypt Woodland Communities

Source Note:

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Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title: Not of Concern Eucalypt Woodland Communities
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn GH	Figure 7	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved xx	File No: QC02-T-MA-0036	
	Date 25.02.09	Revision A	

site was found to contain no weed species and was considered to be potential habitat for EVR flora species *Acacia wardellii* and *Dodonaea macrossanii*.

Remnants of RE 11.7.7 were visited at seven locations during the field surveys (T5, T10, T20, T22, T24, T30 and T31). These sites varied from average to excellent condition. The two sites in excellent condition (T20 and T22) were located within Gurulmundi State Forest and were considered to provide potential habitat for EVR flora species. At one of these sites (T20), field surveys observed a large patch of *Acacia curranii*, a species listed as Vulnerable under both the NC Act and EPBC Act.

According to Herbarium mapping, five REs have an area within the CSG Field that is between 2% and 9% of that which occurs in the bioregion (**Table 3**). These are the REs 11.3.14 (4.1%), 11.3.18 (2.2%), 11.5.4 (5.6%), 11.5.20 (3.4%) and 11.7.6 (3%). Field surveys confirmed the presence of the majority of these REs on six sites within the CSG Field (T9, T12, T14, T15, T16, and T18). Field surveys encountered one discrepancy when an area mapped as the mixed community RE 11.5.20/11.3.3 was found to be RE 11.5.2/11.3.1. Due to time and access constraints no mapped areas of RE 11.3.14 were assessed and therefore Herbarium mapping is assumed to be accurate.

The sites visited were generally mixed communities that varied between good and very good condition. Many of these sites displayed evidence of past logging practices and at least two (T12, T15) contained the environmental weed Mayne's Pest (*Verbena tenuisecta*)

Queensland Herbarium Mapping indicates that at least seven REs have an area within the CSG Field less than 2% of that which occurs in the bioregion. These are REs 11.3.19 (0.1%), 11.3.26 (0.2%), 11.5.5 (0.4%), 11.5.21 (0.7%), 11.9.9 (0.1%), 11.10.1 (1.2%) and 11.10.9 (0.2%). Due to both the small extent of these REs and land access constraints only three sites confirmed the presence of the REs 11.3.19 (T4), 11.3.26 (T41) and 11.10.1(T37). These sites varied from an average to a degraded condition. The condition of the degraded areas was attributed to past land uses such as logging and mining (e.g. T37, T41), and present uses such as cattle grazing.

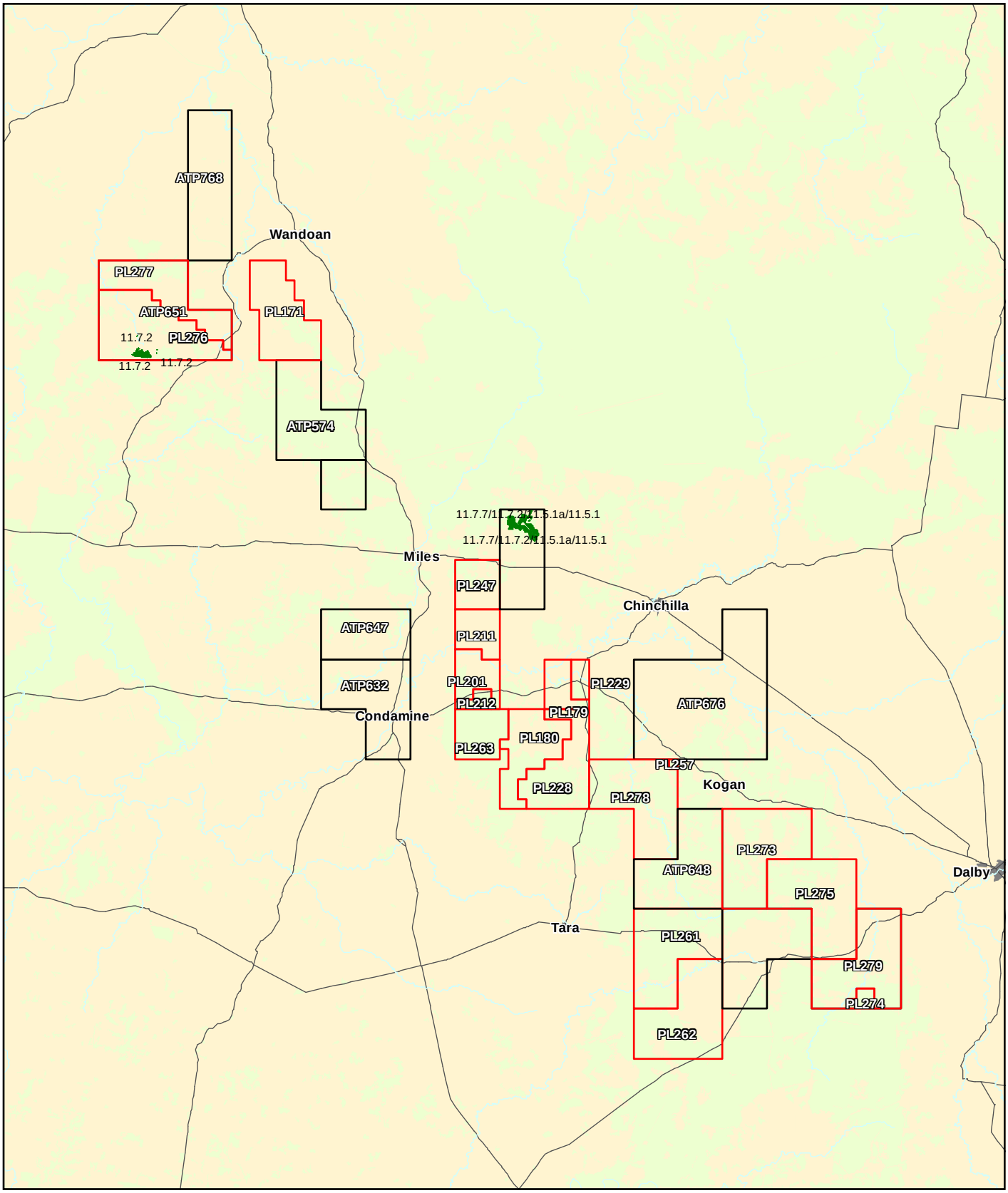
The Acacia woodland community (RE11.7.2) occurs in localised small patches south of ATP651 and north of ATP675 in block "Avon Downs" (**Figure 8**). This RE could not be accessed during the field survey.

The proportion of RE 11.7.2 which occurs within the CSG Field is approximately 5% of that found in a 200 km x 200 km area centred on the CSG Field and less than 1% of that found in the Bioregion.

Desktop studies indicate that the Riparian Woodland community RE 11.3.25 generally occurs within the CSG Field in long thin fragments along creeks and drainage lines. Field surveys confirmed this to be the case with condition varying from degraded to good condition.

Approximately 6 693 ha of RE 11.3.25 is located within the CSG Field. This equates to approximately 15.8% of that found in a 200 km x 200 km area centred on the CSG Field and 1.4% of that which occurs within the bioregion

The Freshwater wetland community (RE 11.3.27) occurs in small and narrow fragments in two areas within the CSG Field: in the central part of the CSG Field, south of ATP632 and in the southern part of the CSG Field, east within ATP648 (**Figure 9**). A very small patch also occurs in block "Celeste" south-east of



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Acacia woodland

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: Acacia woodlands
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: GH	Figure: 8	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
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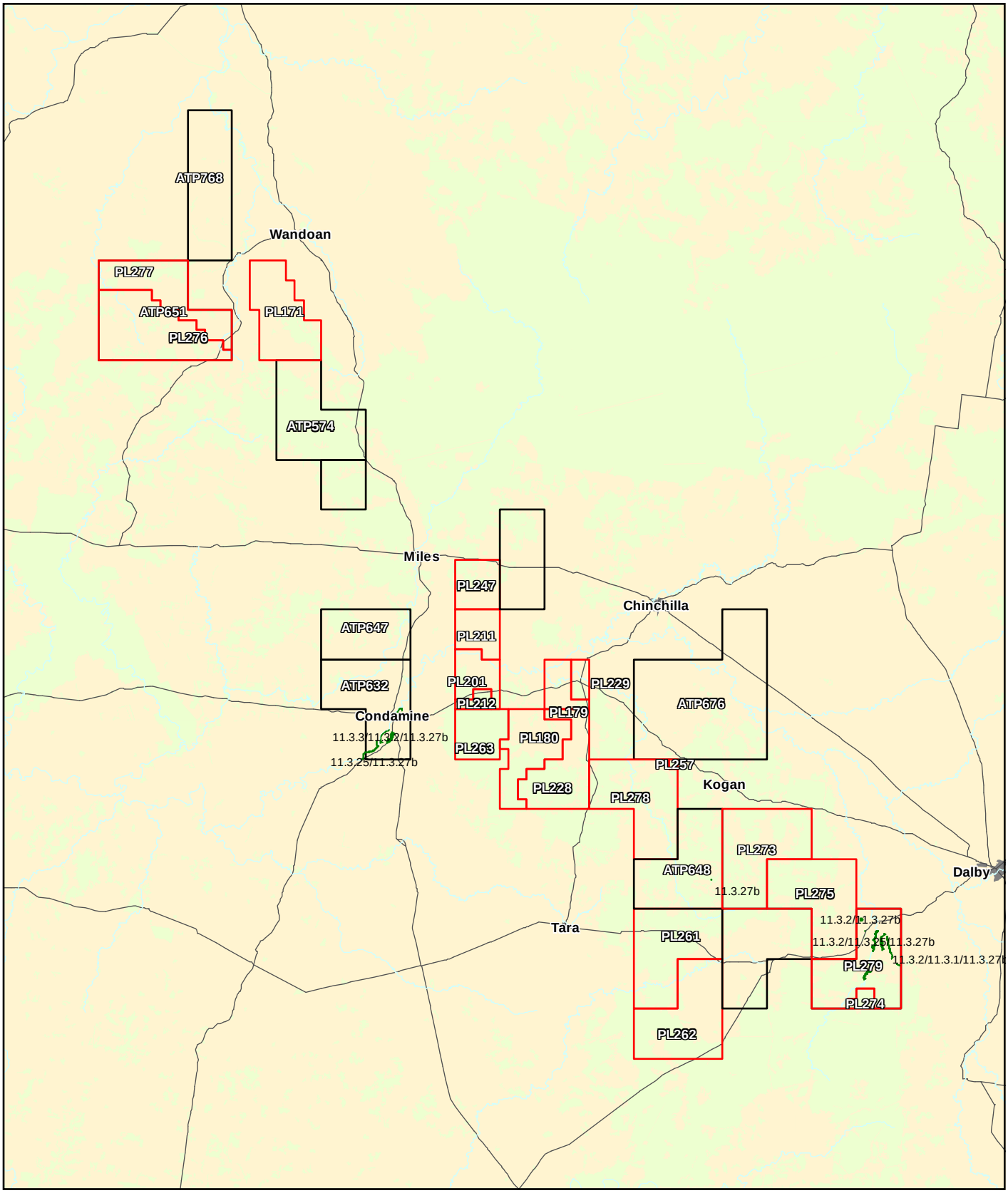
	Date: 26.02.09	Revision: A	



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Freshwater wetlands (RE 11.3.27b)

Source Note:

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0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Freshwater wetlands (RE 11.3.27b)**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: GH	Figure: 9	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
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	Date: 26.02.09	Revision: A	

ATP648. This RE could not be accessed during the field survey due to landholder access constraints.

The approximate area of RE 11.3.27 which occurs within the CSG Field is 111 ha. This equates to less than 10% of that found in a 200 km x 200 km area centred on the CSG Field and less than 1% of that found in the Bioregion.

The Shrubland community (RE 11.7.5) occurs on natural scolds across the majority of the CSG Field, commonly in its southern part (**Figure 10** includes areas in which RE 11.7.5 is a subdominant community). This RE was found in six Tertiary sites, two of which are in excellent condition (i.e. T20 and T22) and contain two flora species listed as Vulnerable under both the NC Act and EPBC Act (i.e. *Acacia curranii* and *Calytrix gurulmundensis*).

The proportion of RE 11.7.5 which occurs within the CSG Field is approximately 32% of that found in a 200 km x 200 km area centred on the CSG Field and approximately 15.5% of that found in the Bioregion.

The Semi-evergreen vine thicket community (RE 11.8.3) occurs in very small patches in the eastern areas of PL171 and could not be accessed during the field survey (**Figure 4**).

The proportion of RE 11.8.3 which occurs within the CSG Field is approximately 1.5 % of that found in a 200 km x 200 km area centred on the CSG Field and less than 0.05 % of that found in the Bioregion.

6.1.6 EVR Flora Species

Review of the Queensland Herbarium HERBRECS, Wildnet and the EPBC Act Protected Matters databases, for the study area identified 48 EVR plant species that are known to occur in or have ranges that overlap with the CSG Field **Attachment 8**. These include:

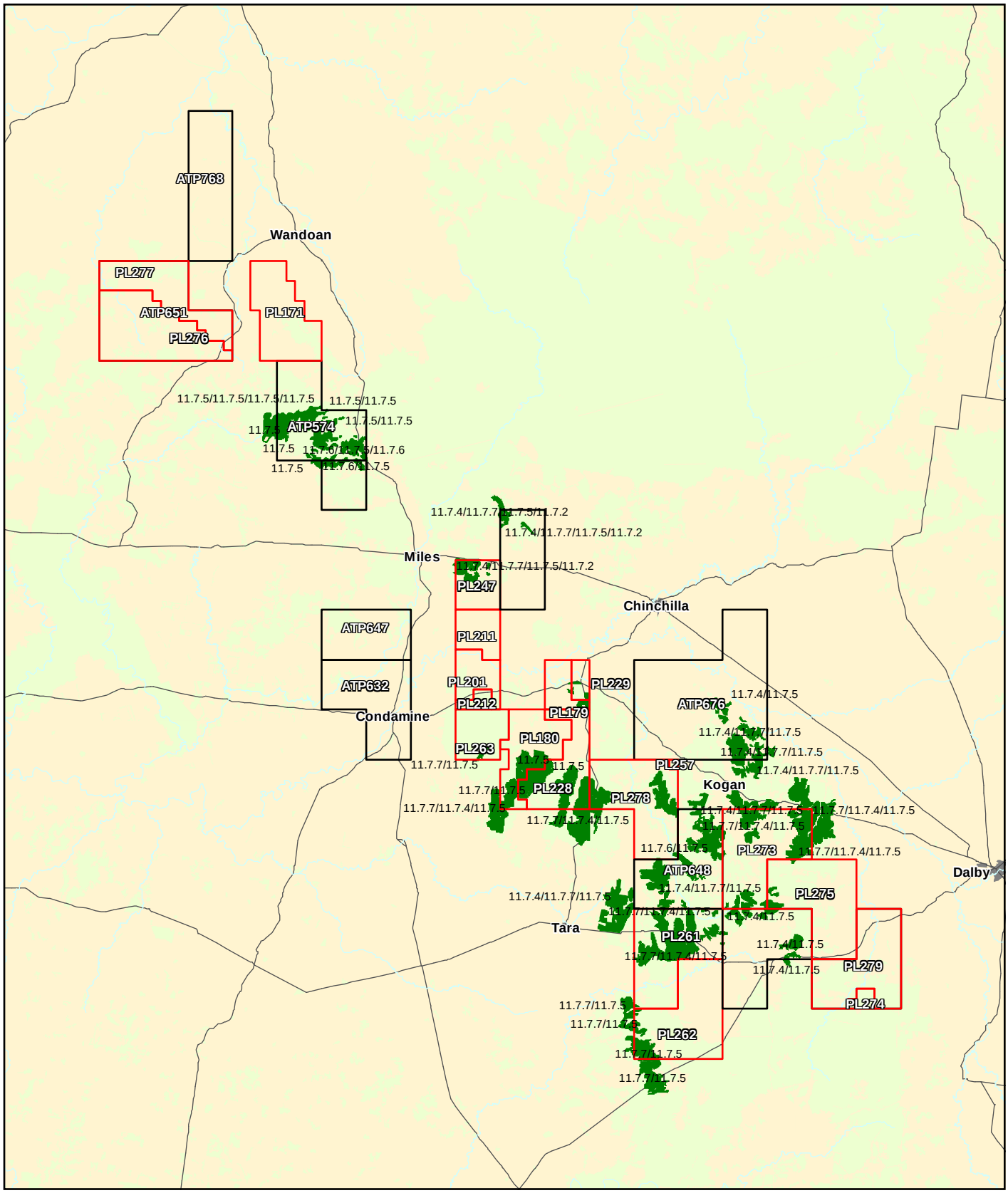
- 44 species listed under the provisions of the NC Act, including 6 Endangered, 20 Vulnerable, and 18 Rare species, and
- 24 species listed under the provisions of the EPBC Act, including 3 Endangered, and 21 Vulnerable species.

These species and their preferred habitats were targeted during the field survey work.

Of these:

- Eight EVR flora species have been recorded within the CSG Field, by HERBRECS and by the field assessment. These 8, and 25 additional species, have preferred habitat within the CSG Field (**Table 4**), and
- 15 are considered unlikely to occur based on the absence of their preferred habitat (**Attachment 8**).

The known locations of EVR flora are presented in **Figure 11**. Note that as it is not possible to undertake detailed flora surveys for the entire CSG Field, EVR flora species will be found in many additional locations to those shown in **Figure 11**. The known EVR locations indicate that EVR plants are known to occur in a range of RE habitat types. Of particular note is the high incidence of EVRs occurring in remnant vegetation within Landzone 7 (**Figure 12**).



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- RE 11.7.5 (Includes areas in which Sub-dominant)

Source Note:

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Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title **Shrubland (RE 11.7.5)**
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn GH	**Figure 10**	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved xx	File No: QC02-T-MA-0039	
	Date 26.02.09	Revision A	

Table 4: EVR Flora Recorded or With Preferred Habitat Within the CSG Field.

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
Waajie Wattle	*Acacia barakulensis*	V	-	Found nearby at Barakula SF only	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Brown Wattle	*Acacia brunioides*	R	-	In the southern Moreton district restricted to some mountain peaks (Stanley and Ross, 1983). Commonly found sandy, poor soils derived from granite geology (PlantNET)	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Acacia chinchillensis*	V	V	Sandy soils. Widespread but uncommon.	Yes	1,2,3,4	6/3	All sites were in RE 11.5.1 across the southern parts CSG Field. Confirmed Herbarium known site where the population consisted of twenty plants scattered over 1 ha. Also recorded at an additional location consisting of five individuals on a graded 10 m x 10 m area adjacent to an access track. Appears tolerant of disturbance.
Curly-bark Wattle	*Acacia curranii*	V	V	Only known from Gurulmundi wildflower area in Gurulmundi State Forest.	Yes	1,2,3,4	6/2	Gurulmundi State Forest only. The majority within RE 11.7.5. Herbarium sites confirmed. Additionally an extra population recorded further from roads.

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
								Populations large, consisting of 100's of individual plants and spread across areas in excess of 1 km^2. Populations dense and in association with other EVR flora species (especially *Micromyrtus carinata*). Dense populations present in avoidable patches within RE 11.7.5. Affected by varying fire regimes through the State Forest but apparently fire tolerant/ loving.
Tara Wattle	*Acacia lauta*	V	V	Known from Tara to Inglewood.	Yes	1,2,3	0[C]/0	Searched for the one known Herbarium site within the vicinity of the CSG Field north of Tara along Chinchilla-Tara Rd. Not able to be located due to scale of record accuracy.
None known	*Acacia tenuinervis*	R	-	Associated with red ridges. Recorded North of Glenmorgan along loamy ridges with spotted gum and narrow-leaf ironbark (Lester 2008)	Yes	2,3	0[C]/0	A number of Herbarium records north of the central CSG Fields in the Chinchilla area. Field surveys did not find any presence of this species.
None known	*Acacia wardellii*	V	V	Ridge crests with loamy or gravely soil. Coloniser of disturbed areas – Thomby Range	Yes	1,2,3,4	6/2	Populations recorded east of Condamine. Verified Herbarium record and found one other very large population which spread for 1 km along a pipeline easement. The population consisted of two trees with

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
				and a few ridges east of the Condamine.				large numbers of young spreading along the pipeline by construction activities. Tolerant of disturbance.
Queensland Lace Plant	*Aponogeton queenslandicus*	R	-	A seasonally emergent aquatic plant found in throughout much of coastal Queensland. In rivers, streams and temporary freshwater pools to 30-60cm depth. Not usually found in permanent waters (Stephens and Dowling, 2002).	Yes	2,3	0[C]/0	Herbarium records of one sighting on just outside the most northern CSG Field. Field surveys did not find this species to occur in any areas within the CSG Field, although it is possible that they do occur in preferred habitat types.
Ooline	*Cadellia pentastylis*	V	V	Clay plains, sandstone and residual ridges in association with vine thickets, brigalow, belah and red bauhinia.	Yes	1,2,3,4	1/1[D]	Observed in north-easternmost CSG Fields. Single trees scattered through grazing paddocks. Also likely in SEVT patches (not visited due to access constraints). Possible elsewhere in CSG Field but none observed.
None known	*Calytrix gurulmundensis*	V	V	Found on lateritic sandstone ridges. Localised and patchy	Yes	1,2,3,4	4/1	Gurulmundi State Forest only. Found within RE 11.7.5 Verified Herbarium site and found additional small isolated patches

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
				distribution.				spreading along access tracks. Appears that grader activities have spread plants along access tracks radiating out from a main population which is spread over an area of several square kilometres. Plants dense in sunlight exposed locations and sparse in shaded areas. Appears tolerant of disturbance.
None known	*Commersonia argentea*	-	V	Stony ridges, north of Chinchilla	Yes	1	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Cryptandra ciliata*	R	-	Know record at Gurulmundi State Forest (Qld Herbarium)	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Small-leaved Denhamia	*Denhamia parvifolia*	V	V	Found in semi-evergreen vine thickets. Brown loam or clay loam soils.	Yes	1,3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Diuris tricolor (sheaffiana)*		V	Sandy soils, often in Callitris woodlands. Primarily a NSW species with scattered records in Qld.	Yes	1,2	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Blake's	*Eleocharis*	R	-	Known in Wet	Yes	3	0/0	Neither Herbarium records nor field

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
Spikerush	*blakeana*			poorly drained soils; Records along Auburn Rd Chinchilla and Lake Broadwater				surveys recorded this species within or in the vicinity of the CSG Field.
Plunkett Mallee	*Eucalyptus curtisii*	R	-	Eucalypt forests, woodlands and shrublands on rocky slopes or on low poorly drained sites (Qld Herb., 2001).	Yes	2,3,4	1/1	Known from Vickery State Forest and near the Condamine Power Station, east of Miles (Ison, 2006). Ison's record is of an individual small tree adjacent to Condamine Power Station. Confirmed Herbarium record which consisted of two small trees on the edge of RE 11.7.5 (in amongst heathland). Likely to occur in other parts of CSG Field (but not observed).
Pumpkin Gum	*Eucalyptus pachycalyx*	R	-	Known within Barakula S F	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Eucalyptus rubiginosa*	R	-	Found in Barakula S F Chinchilla Area	Yes	2,3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Shiny-leaved Ironbark	*Eucalyptus virens*	V	V	Sandstone ridges. Four populations – 1) Coolmunda Conservation Park 2) Tara, 3) NE of Eidsvold and 4) Maranoa	Yes	1,2,3	0[C]/0	Herbarium records indicate one sighting of this species approximately 3 km south of the CSG Field. Field surveys did not record this species anywhere within the CSG Field, although it is possible that they do occur in preferred habitat types.

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
				River near Mt Moffatt.				
Fimbristylis vagans	*Fimbristylis vagans*	R	-	Wet creek/drainage lines Wetland plant recorded in the nearby Lake Broadwater Area	Yes	2,3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Gonocarpus urceolatus*	V	-	Recorded near Chinchilla on heavy loam soils.	Yes	2,3	0[C]/0	No recorded sightings within the CSG Field. One Herbariums sighting located approximately 7km west of the eastern CSG Fields.
None known	*Grevillea singuliflora*	R	-	Known habitat is Barakula S F	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Homopholis belsonii*	E	V	Erect or ascending perennial to 40cm tall with panicles up to 25cm x 20cm. Known from near Gurulmundi, 30km north of Miles in the Darling Downs district (Stanley and Ross, 1989).	Yes	1,3	0[C]/0	Herbarium records show one tentative sighting to the north east of the CSG Field (north east of Miles). Field surveys did not record this species anywhere within the CSG Field, although it is possible that they do occur in preferred habitat types.
None	*Homoranthus*	V	V	Found in two separate	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
known	*decumbens*			locations 1) Blackdown Tablelands and 2) State Forest 302, north of Chinchilla.				the vicinity of the CSG Field.
None known	*Melaleuca groveana*	R	-	Occurs on ridges, high mountain slopes and mountain summits in heaths and eucalypt woodland and forests with heath understories (DNR, 1999).	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Gurulmundi Heath-myrtle	*Micromyrtus carinata*	E	-	Type collected from Gurulmundi SF	Yes	2,3,4	5/6	Gurulmundi State Forest only. Along edges of RE 11.7.6 and RE 11.7.5. Verified Herbarium sites and identified a number of additional locations. Many hectares through the State Forest. Thousands of plants. Populations usually dense patches on laterised scolds.
None known	*Micromyrtus patula*	E	-	Found within the area by Qld Herbarium	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Notelaea pungens*	R	-	Known herbarium records Barakula	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in

Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
				S F Chinchilla				the vicinity of the CSG Field.
None known	*Philotheca sporadica*	V	V	On residual lateritic rises particularly between Tara and Kogan.	Yes	1,2,3,4	9/10	Dominant in patches on laterised scalds through central parts of the CSG Field (e.g. in the vicinity of Graham's Road, Mary's Roads, Kogan and Braemar State Forest). Generally recorded within land zone 7. However, is also possible in the nearby areas where suitable habitat occurs (e.g. RE 11.7.5).
None known	*Rutidosis glandulosa*	R	-	Recorded from Barakula State Forest (Kokubugata & Holland 2002)	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Rutidosis lanata*	E	-	Occurs in Eucalypt and Acacia forests. Two populations known 1) near Jackson and 2) near Meandarra.	Yes	2,3	0[C]/0	Not recorded or surveyed within the CSG Field. Two recorded sightings on the outside of fields: 1) Tentative recording south of the most eastern areas of the CSG Field and 2) Just north of the CSG Field, south east of Chinchilla
None known	*Solanum papaverifolium*	E	-	Heavy black soils (Stanley and Ross, 1986).	Yes	3	0[C]/0	Three recorded sights on the outside of the most eastern areas of the CSG Field. Field surveys did not detect any presence of this species.
None known	*Solanum stenopterum*	V	-	Cracking clay soils in vine thickets,	Yes	2,3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.

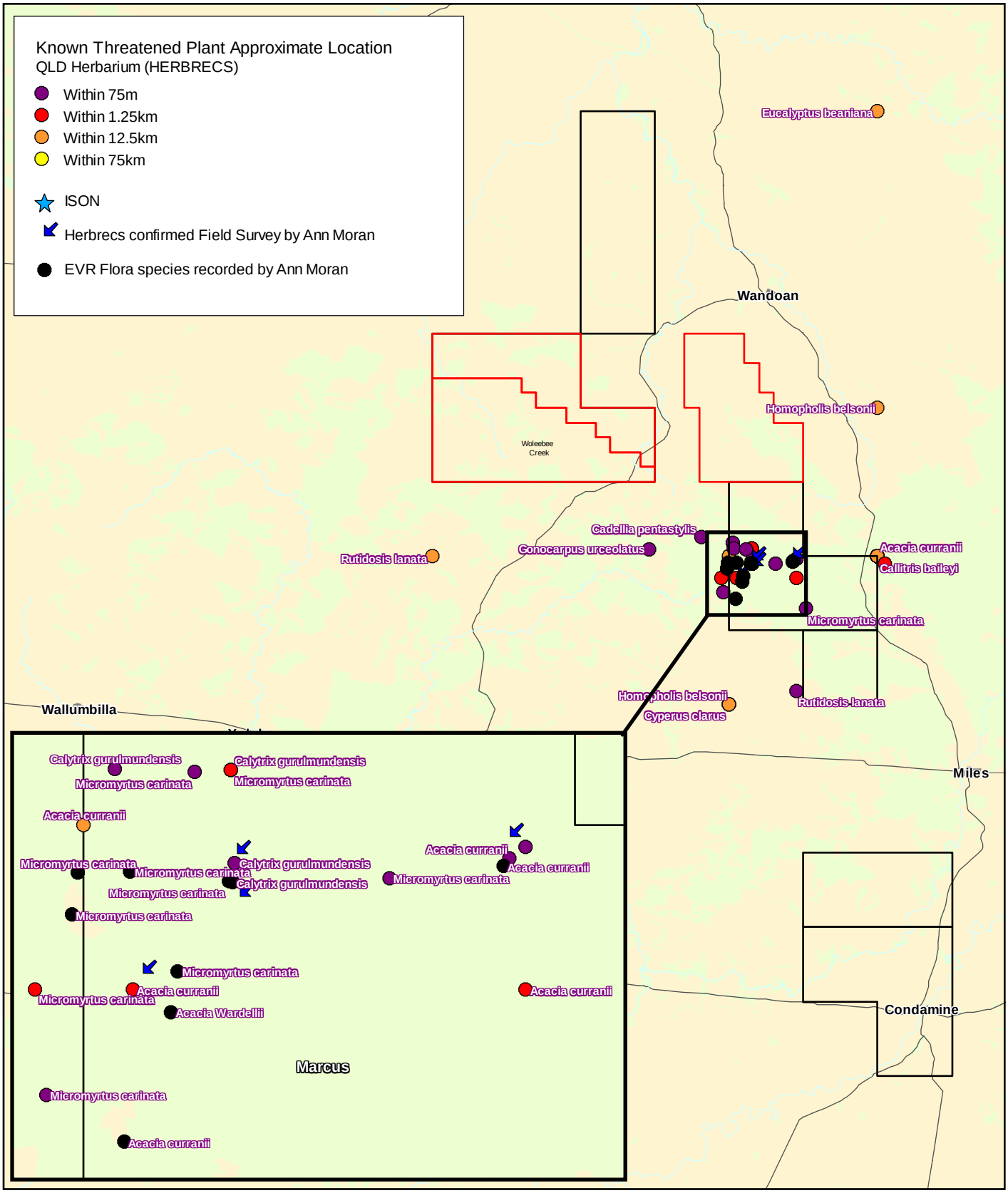
Common Name	Scientific Name	Status [A]		Preferred Habitat	Preferred habitat present	Source [B]	No. of Herbrecs Records / No. of Field Survey Records	Comments
		NCA	EPBC					
				woodlands and grassy plains.				

[A] NCA: State listed E = Endangered; V = Vulnerable; R = Rare
EPBC: Australian Government listed: E = Endangered; V = Vulnerable

[B]: Source: 1 = EPBC Protected Matters search; 2 = WildNet; 3 = Herbrecs; 4 = Field survey for this study

[C]: Known records outside of CSG Field

[D]: Field survey site same as Herbrecs



Legend:

CSG Fields - ATP

CSG Fields - PL

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0 5 10 15 20 25

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project **Queensland Curtis LNG Project**

Client **QGC - A BG Group business**

Title **Known EVR Locations**

Map 1 of 2

Environmental Resources Management Australia Pty Ltd

Drawn	GH	**Figure**	**11a**
Approved	xx	File No:	QC02-T-MA-0004
Date	26.02.09	Revision	A

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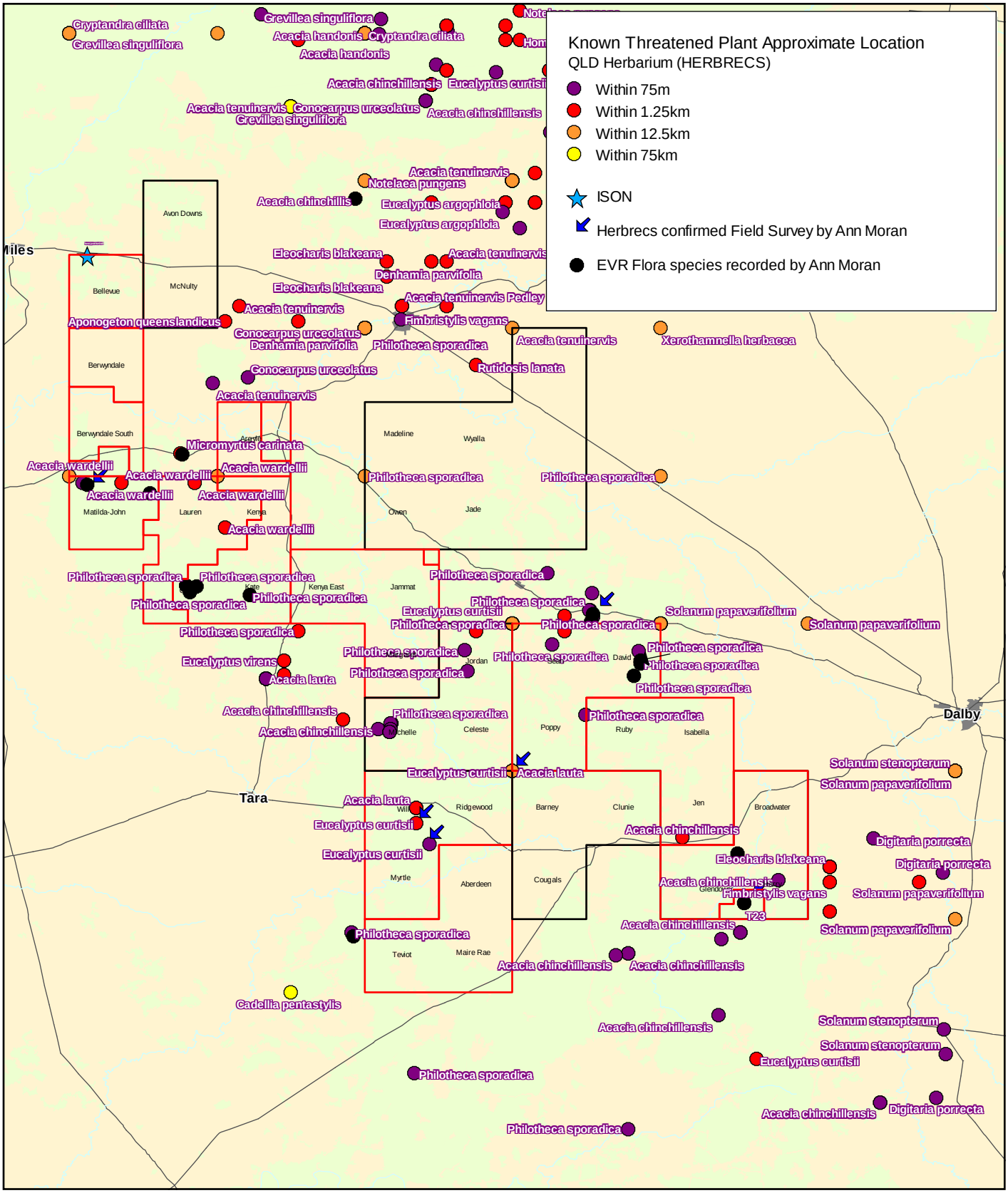

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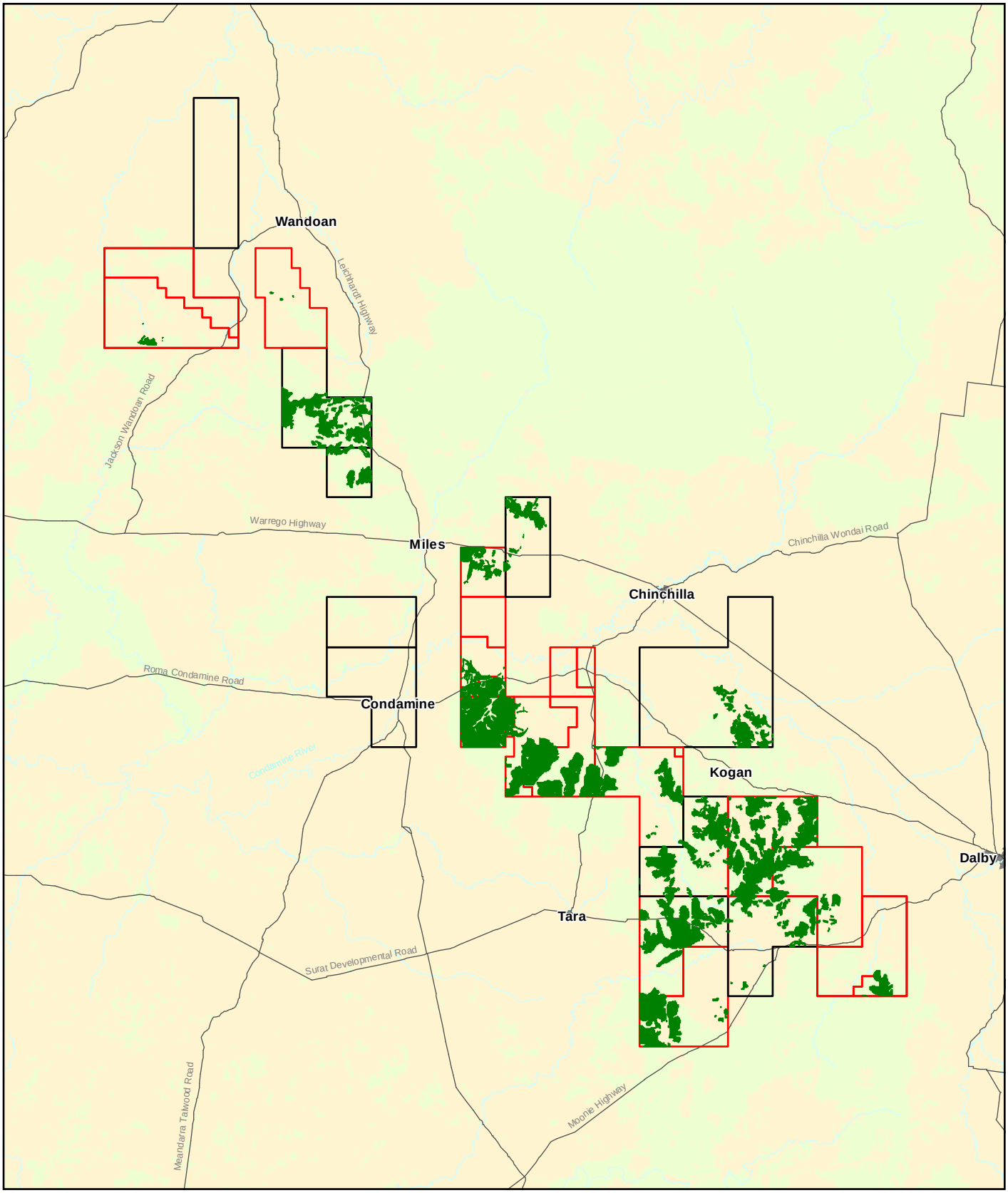
QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title **Known EVR Locations**
	Client	QGC - A BG Group business	Map 2 of 2
ERM Environmental Resources Management Australia Pty Ltd	Drawn GH	**Figure 11b**	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved xx	File No: QC02-T-MA-0005	
	Date 26.02.09	Revision A	



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- Land Zone 7

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Kilometres

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Regional Ecosystem Land Zone 7 - Overview**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: xx	**Figure: 12**	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: xx	File No: QC02-T-MA-0003	
	Date: xx.xx.xx	Revision: A	

6.1.7 Regionally Significant Flora Species

In addition to the EVR flora species, four Regionally Significant flora species are known to occur within the CSG Field. These species have not been listed as being EVR under the EPBC Act or NC Act, but have been identified by the Environmental Protection Agency (EPA 2008b) as non-EVR priority taxa for the Brigalow Belt Bioregion. These are:

- *Acacia aprepta* (Miles Mulga) – occurs as a dominant in patches with scattered distribution in the central portions of the CSG Field around Miles. The distribution of this species also extends well outside of the CSG Field
- *Acacia shirleyi* (Lancewood) – scattered distribution, widespread and common. The distribution of this species also extends well outside of the CSG Field
- *Corymbia bloxsomei* – occasionally along edges of RE 11.7.5 in the northern part of the CSG Field in Gurulmundi State Forest (Site M1). The distribution of this species also extends well outside of the CSG Field, and
- *Dodonaea macrossanii* – widespread and common around the Condamine area, particularly in RE 11.5.1. Occurs often along roadsides and is often heavily grazed by kangaroos and wallabies down to stump level. The distribution of this species also extends well outside of the CSG Field.

6.1.8 Least Concern Flora

A complete list of all flora species observed during the field survey is provided in **Attachment 9**. The field flora surveys recorded a total of 326 least concern flora species. Site records for all species are provided in **Attachment 7**.

Least Concern Flora known to be of regional significance (as per EPA 2008b) are identified in **Section 6.1.3** (above).

6.1.9 Aquatic Flora

Habitat for aquatic flora within the CSG Field is limited to ephemeral watercourses, wetlands, farm dams and weirs. The Condamine River runs through the southern portion of the QGC Field and although it recently flowed after heavy rain in the catchment, for the most part it may also be described as an ephemeral watercourse with a number of large permanent waterholes.

A small number of common aquatic plants including *Phragmites australe, Cyperus* spp. and *Juncus* spp. were observed within and on the margins of these aquatic habitats.

Although there are no records of EVR aquatic flora species within the CSG Field, two (*Eleocharis blakeana* and *Fimbristylis vagans*) are known to occur in the neighbouring Lake Broadwater (immediately east of the CSG Field). Under the right seasonal conditions, there is potential for these two EVR species, as well as the Queensland Lace Plant (*Aponogeton queenslandicus* listed as Rare under the NC Act), to occur within freshwater pools in watercourses, farm dams and weirs within the CSG Field.

Surface water features within the CSG Field are described in detail within *QGC Water Studies Upstream –Surface Water Impact Assessment* (Golder, 2009a).

6.1.10 Declared Weeds

The field survey detected only two declared weeds on the CSG Field:

- Mother of Millions (*Bryophyllum delagoense*), and
- Prickly Pear (*Opuntia* spp.)

Declared weeds are those species listed as noxious in the LP Act. Under this Act, pest species for both plants and animals are classified into three categories:

- Class 1 species: not generally established in Queensland and has potential to cause adverse economic, environmental or social impact. The landowner is obliged to take reasonable steps to keep their land free of Class 1 pest species, unless the owner holds a declared pest permit allowing the pests to be kept on the land
- Class 2 species: are established in Queensland and can cause significant adverse economical, environmental or social impact. The landowner is obliged to take reasonable steps to keep their land free of Class 2 pest species, unless the owner holds a declared pest permit allowing the pests to be kept on the land, and
- Class 3 species: established in Queensland and has or could have adverse economical, environmental or social impact. Legislative obligations relating to control these species are generally limited to specific conservation areas.

Mother of Millions is a Class 2 pest which displaces native ground storey species in a range of native communities. Prickly Pear is a Class 2 pest which invades a wide range of native communities.

Declared weeds are most prevalent in communities on Land Zone 3, which have more fertile alluvial soils. Lowest weed levels were recorded in communities on sand plains (Land Zone 5) and lateritic soils (Land Zone 7).

Table 5 summarises the known distribution of declared weeds within the CSG Field, including survey locations and REs. As the entire area of the CSG Field was not inspected, these weeds (and other declared species) may also be present in other locations.

Numerous environmental weeds were also recorded during field surveys. Species that may impede rehabilitation works following construction include:

- Maynes Pest (*Verbena tenuisecta)*
- Mimosa Bush (*Acacia farnesiana*), and
- Exotic pasture and roadside grasses, such as:
  - African Love Grass (*Eragrostis curvula*)
  - Buffel Grass (*Cenchrus ciliaris*)
  - Guinea Grass (*Megathyrsus maximus* - syn. *Panicum maximum*).

Many REs have been substantially degraded by Buffel Grass and Guinea Grass, both of which have the capacity to displace native ground storey species and alter fire regimes irrevocably. Buffel Grass is now recognised as an emerging

environmental weed of considerable importance (Best 1998; Clarke *et al*. 2005; Greenfield 2007). It is also widely used in the region as a pasture grass.

Table 5: Recorded Locations of Declared Weeds

Name	General Distribution	Flora Site N°	REs
Mother of Millions	Recorded mostly in the southern part of the CSG Field (i.e. ATP676, PL269, west of PL261)	T1,T3,T21,T29, T32	11.3.2 11.3.4 11.5.1
Prickly Pear	Occurs across the tenements, generally in low densities as scattered individuals.	T2,T4,T6,T18,T26, T27, T31, T32,T34, T35, T43, T45	11.3.1 11.3.25 11.3.26 11.5.1 11.5.4 11.7.5

6.2 Fauna Environment

6.2.1 Fauna Habitats

The CSG Field encompasses vegetated and cleared grazing land and cropping land, roadside and travelling stock reserves, Council lands, State Forests and Resource Reserves.

As described in the flora description the CSG Field is approximately 468,700 ha in size. Of this, 260,047 ha is cleared. The remnant vegetation in the CSG Field equates to 171,255 ha and consists of approximately:

- 149,414 ha of Eucalypt woodlands
- 975 ha of Acacia woodlands
- 3,617 ha of Brigalow / Belah woodland
- 621 ha of Semi-evergreen Vine Thicket
- 6,693 ha of riparian Eucalypt woodland
- 9,824 ha of shrubland on scalds, and
- 111 ha of wetlands.

Fauna habitats on most rural lands and roadside verges in the CSG Field are fragmented and substantially degraded. Most areas have a long history of grazing, timber removal and invasion by environmental weeds. Nevertheless, some areas, particularly riparian zones, have significant fauna habitat values with a relatively high percentage of hollow-bearing trees, moderate to high levels of understorey vegetation and leaf litter. The relatively moist riparian environments support more regular and heavy flowering eucalypt communities which are important food sources for many bird species. Two Little Red Flying Fox (*Pteropus scapulatus*) colonies were also found in the area at the time of the study and were observed to be feeding principally along these riparian areas.

The majority of Brigalow (*Acacia harpophylla*) woodlands and tall shrublands occur as narrow wind breaks between cultivated or grazed paddocks or along roadside verges. They are usually heavily infested with introduced grasses and their overall quality as fauna habitats is marginal in these areas.

All habitats (even cleared and degraded land), provide habitat for a range of common native fauna species. Remnant vegetation provides higher habitat values and thus will have a larger range of more common and abundant species.

From observations made during the surveys it seems likely that several factors have combined over a period of time to reduce biodiversity in the area. These factors vary in their influence across the region and also between habitat types. They include:

- Frequent cool winter fires that have removed ground cover in many habitats. These fires are likely to have removed food resources and exposed fauna to elevated predation risks (Garden *et al*. 2007b; Letnic 2007; Priddel *et al*. 2007)
- In the southern areas of the CSG Field, foxes are particularly abundant and these highly efficient predators are well known to pose a serious risk to

terrestrial fauna, particularly were ground cover is scant (Briggs *et al.* 2007; Gentle *et al*. 2007; McKenzie *et al*. 2007; Priddel *et al.* 2007; Salo *et al*. 2007)

- Grazing and the establishment of environmental weeds, particularly Buffel Grass (*Cenchrus ciliaris*) are a serious threat to the integrity of many fauna habitats. Buffel Grass is now becoming widely recognized as a serious environmental weed in natural habitats but is also an important pasture grass for graziers (Best 1998; Clarke *et al.* 2005; Greenfield 2007), and
- Grazing has also exerted significant pressure on many natural habitats and has substantially degraded understorey vegetation structure in some areas (Munro et al. 2007).

The survey found no bandicoots, bettongs or other terrestrial mammals in this size range in the CSG Field south of the Warrego Highway. Also notably absent were leaf litter dependent species such as Death Adders (*Acanthopis antarcticus*) and the Brigalow Scaly-foot (*Paradelma orientalis*).

6.2.2 EVR Fauna Species

Database searches identified 33 fauna species listed as EVR under the EPBC Act and / or the NC Act and of these 28 were considered to potentially occur in the area these include:

- 2 Endangered, 9 Vulnerable and 4 Rare under the NC Act, and
- 4 Endangered, 12 Vulnerable, 11 Migratory and 6 Marine under the EPBC Act.

A list of these EVR species, together with their preferred habitat and an indication as to whether this habitat is present within the CSG Field is given in **Table 6**.

Aquatic EPBC Listed species identified by the EPBC MNES Database as potentially occurring within the region include the Murray Cod (*Maccullochella peelii peelii*) and the Fitzroy River Turtle (*Rheodytes leukops*). The study area is located in the Condamine River catchment which is part of the Murray-Darling system and Murray Cod have been recorded in the area. The Fitzroy River Turtle is however, confined to the Fitzroy River catchment to the north and does not occur in the project area. It has therefore been excluded from further consideration.

Table 6: EPBC and NCA Listed Fauna of the QGC CSG Fields

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
Insects					
Imperial Hairstreak Butterfly	*Jalmenus evagoras eubulus*	V[2]	Mature Brigalow communities, often in association with small hills and ridges.	Potential	Yes
Fish					
Murray Cod	*Maccullochella peelii peelii*	V[1]	Freshwater rivers: Murray-Darling System. Introduced to the Mary River, Fairbairn Dam and Cooper Creek.	Potential	No
Reptiles					
Brigalow Scaly-foot	*Paradelma orientalis*	V[1 and 2]	Dry sclerophyll and open woodlands in a wide variety of habitats.	Potential	No
Dunmall's Snake	*Furina dunmalli*	V[1]	In a wide variety of forest and woodland types on heavy clay soils and occasionally in adjoining sandy areas.	Potential	No
Yakka Skink	*Egernia rugosa*	V[1 and 2]	Widespread but uncommon, dry sclerophyll forest and woodlands, fallen logs, rock outcrops.	Potential	No
Five-clawed Worm Skink	*Anomalopus mackayi*	V[1] / E[2]	Recorded in open woodlands with grassy understorey. Rare and poorly known.	Potential	No
Grassland Earless Dragon	*Tympanocryptus pinguicolla*	E[1]	Grasslands of black soil plains of the Darling Downs. Often found in cultivated paddocks with nearby grass cover.	Potential	No
Golden-tailed Gecko	*Strophurus taenicauda*	R[2]	Woodlands and open forests – Brigalow and Eucalypt associations.	Potential	Yes
Birds					
Swift Parrot	*Lathamus discolor*	E[1]	Occasional visitor to Qld when feeding on Eucalypt forests in winter. Breeds in Tasmania.	Potential occasional	No
Star Finch	*Neochima ruficauda ruficauda*	E[1]	Riverine habitats in tall grass. Not recorded from the region in the 1998-2002 Birds Australia Atlas.	Unlikely	No
Regent Honeyeater	*Anthochaera phrygia*	E[1], Mi	Dry Ironbark woodland associations. Irregular winter visitor to Qld.	Potential occasional	No
Paradise Parrot	*Psephotus pulcherrimus*	EX[1 and 2]	Open grassy ironbark woodlands. Last	Unlikely	No

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
			reported 1927.		
Australian Painted Snipe	*Rostratula australis*	V[1]	Marshes and swamps in tall grass.	Potential	No
Glossy Black-cockatoo	*Calyptorhynchus lathami*	V[2]	Eucalypt forests with casuarina sp. Modelling has indicated strong correlation with riparian Eucalypt communities.	Potential	Yes
Black-breasted Button-quail	*Turnix melanogaster*	V[1 and 2]	Dry rainforest and vine forest. Marginal in adjoining farmlands.	Potential	No
Plains-wanderer	*Pedionomus torquatus*	V[1 and 2]	Known only from Diamantina Shire, to the west of the project area.	Unlikely	No
Red Goshawk	*Erythrotriorchis radiatus*	V[1] / E[2]	Patchy distribution in relatively large expanses of forest and woodland.	Potential	No
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V[1 and 2]	Patchy distribution in dry eucalypt forest, often near water. Not recorded from the QGC fields – occurs further north.	Unlikely	No
White-bellied Sea Eagle	*Haliaeetus leucogaster*	Mi, Ma	Inland locations – permanent and often extensive freshwater lagoons and aquatic systems.	Unlikely	No
White-throated Needletail	*Hirundapus caudacutus*	Mi	Aerial forager, thought to sleep on the wing. A widespread, seasonal visitor to Australia. Unlikely to land in the project area.	Potential	Yes
Rainbow Bee-eater	*Merops ornatus*	Mi	Summer migrant, breeding in sand ridges and creek banks in many habitat types. Common.	Potential	No
Rufous Fantail	*Rhipidura rufifrons*	Mi	A common and widespread bird in a variety of habitat types but often preferring dense vegetation.	Potential	No
Great Egret	*Ardea alba*	Mi, Ma	Widespread in wetland habitats.	Potential	No
Cattle Egret	*Ardea ibis*	Mi, Ma	Common and widespread over much of Australia. Nomadic in arid areas.	Potential	No
Lathams Snipe	*Gallinago hardwickii*	Mi, Ma	Widespread in eastern Australia. Wetlands.	Potential	No
Australian Cotton Pygmy-goose	*Nettapus coromandelianus albipennis*	Mi	Widespread in eastern Australia. Aquatic; permanent freshwater lagoons, swamps and rivers. Often with dense aquatic vegetation.	Potential	No

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
Freckled Duck	*Stictonetta naevosa*	R[2]	Nomadic and rare in south-eastern Australia. Well vegetated aquatic environments.	Potential	No, (seen at Lake Broadwater on the eastern margin of the CSG Field)
Painted Snipe	*Rostratula benghalensis*	Mi / V[2]	Marshes and wetlands	Potential	No
Fork-tailed Swift	*Apus pacificus*	Mi, Ma	Aerial insectivore, widespread distribution.	Potential	Yes
Magpie Goose	*Anseranus semipalmata*	Ma	Marshes and swamps	Potential	No, (seen at Lake Broadwater on the eastern margin of the CSG Field)
Mammals					
Eastern Long-eared Bat	*Nyctophilus timoriensis*	V[1 and 2]	Widespread but uncommon in dry forests and woodlands from Vic to central south Qld.	Potential	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	V[1] / R[2]	Patchily distributed in association with sandstone escarpments but also occurs in eucalypt forests and woodlands.	Potential	Tentative Record at Gurulmundi SF
Little Pied Bat	*Chalinolobus picatus*	R[2]	Patchily distributed in woodlands and forests across arid south west and central north Queensland.	Potential	Yes

***Status:** [1]: Commonwealth (EPBC) listed: **EX** = Extinct; **CE** = Critically Endangered; **E** = Endangered; **V** = Vulnerable; **Mi** = Migratory Species, **Ma** = Marine Species.

[2]: State (NC Act) listed: **EX** = Presumed Extinct; **E** = Endangered; **V** = Vulnerable; **R** = Rare.

Field studies identified eight EVR fauna species within the CSG Field. These are:

- Imperial Hairstreak Butterfly (*Jalmenus evagoras eubulus*)- Vulnerable under the NC Act
- Golden-tailed Gecko (*Strophurus taenicauda*) – Rare under NC Act
- Glossy Black-cockatoo (*Calyptorhynchus lathami*) – Vulnerable under the NC Act
- Little Pied Bat (*Chalinolobus picatus*)- Rare under the NC Act
- Eastern Long-eared Bat (*Nyctophilus timoriensis*)- Vulnerable under the EPBC and the NC Act
- White-throated Needletail (*Hirundapus caudacutus*) – Migratory species
- Fork-tailed Swift (*Apus pacificus*) – Migratory and Marine species, and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) - Vulnerable under the EPBC and the NC Act (Tentative record at Gurulmundi SF).

Field surveys also recorded two additional EVR species at Lake Broadwater, just outside the south-east corner of the CSG Field. These are:

- Freckled Duck (*Stictonetta naevosa*)- Rare under the NC Act, and
- Magpie Goose (*Anseranus semipalmata*) – Marine species.

All EVR fauna records have been submitted to the EPA WildNet database.

EVR fauna species recorded during the survey are described below.

Eastern Long-eared Bat, *Nyctophilus timoriensis*

EPBC: Vulnerable, NCA: Vulnerable, BAMM: Crit. H.

This species was encountered only once during the survey in a relatively extensive tract of natural vegetation near Condamine. Previous records are also known from this area and also to the north of Miles near Gurulmundi State Forest. Other records are known from areas to the south and south-east of the CSG Field and the species is recorded infrequently across the NSW and Queensland Brigalow Belts. It is likely therefore, that this species occurs throughout the CSG Field, possibly restricted to larger tracts of intact native vegetation. The draft Biodiversity Action Plan for EPA Back on Track species in the Murray-Darling Region (EPA 2008d) indicates habitat fragmentation as a major threat to this species.

Large-eared Pied Bat, *Chalinolobus dwyeri*

EPBC: Vulnerable, NCA: Rare, BAMM: Crit. H.

Additionally, an echo-location call of an unknown bat species was recorded on the rocky escarpments in Gurulmundi State Forest. The call is similar to that reported for the EVR Large-eared Pied Bat (Pennay, Law *et al*. 2004) but the identification cannot be confirmed until further reference calls are obtained for this species. For the purposes of this report, a conservative approach is taken and this species has been assumed to occur in areas where suitable habitat exists.

Little Pied Bat, Chalinolobus picatus

NCA: Rare, BAMM: Crit. H.

Initially thought to occur only in the north-east parts of South Australia, but more recent surveys have extended its distribution through western NSW and southern Queensland, as far north as Mackay.

This species was found at only one survey site in the CSG Field despite the relatively high level of trapping effort over the larger area. This appears to be typical for the species, since in past surveys across the Brigalow Belt, it has normally comprised approximately 1% of records (EPA 2008c). For the purposes of this report, it should be considered as present over most of the CSG Field in suitable habitat.

Glossy Black-cockatoo, *Calyptorhynchus funereus*

NCA: Vulnerable, BAMM: Crit. H.

At a national level, the species distribution encompasses eastern Victoria and extends north through coastal and portions of inland NSW and Queensland to as far north as Mackay.

Glossy Black-cockatoos were recorded in Braemar State Forest in the south-eastern part of the CSG Field. They were not noted elsewhere, although WildNet has a record from near Miles. Nevertheless the results of this survey strongly suggest that this species is most abundant in the south-east portion of the CSG Field.

White-throated Needletail, *Hirundapus caudacutus,* EPBC: Mi, and Fork-tailed Swift, *Apus pacificus*, EPBC: Mi, Ma

These birds were observed in the air space over the CSG Field and as in other parts of the continent, it is highly unlikely that they land. Both species possibly sleep on the wing and were observed flying ahead of summer storm fronts in the area. These birds are reliant upon flying insects that may originate in the CSG Field area, but it is highly unlikely that they would be affected in any way by the proposed development.

Golden-tailed Gecko, *Strophurus taenicauda*

NCA: Rare, BAMM: Crit. H

This species was recorded in the southern area of the CSG Field where it occurred in Eucalypt and Acacia woodlands and open forests. It is also known from areas further south and east of the CSG Field (EPA 2008b). It may be expected to occur over much that area including relatively degraded vegetation stands.

Overall distributional range is restricted to the Brigalow Belt Bioregion.

Imperial Hairstreak Butterfly, *Jalmenus evagoras eubulus*

NCA: Vulnerable, BAMM: Crit. H.

This butterfly was recorded in the southern portion of Gurulmundi State Forest in a small area of intact, mature Brigalow (*Acacia harpophylla*), although larvae were on young plants under the canopy cover of mature trees. WildNet also records this species south of Tara. Common and Waterhouse (1981) note that the species does not occur in Brigalow regrowth. It is therefore likely that this species occurs across the CSG Field but would have a significantly patchy and infrequent distribution.

The overall species distribution is restricted to the Brigalow Belt Bioregion.

EVR fauna species not recorded during the field survey but potentially present in the CSG Field are described below.

6.2.3 Regionally Significant Fauna

According to database searches 11 Priority Species listed under the BAMM Assessment for the Brigalow Belt South (Criteria H) (EPA 2008c) may potentially occur within or in the broad vicinity of the CSG Field. Nine of these species were identified during detailed field surveys and are presented in **Table 7** below. Species not identified by the field surveys and yet could still potentially occur within the CSG Field are the Bush Thick-knee (*Burhinus grallarius*) and the Hooded Robin (*Melanodryas cucullata*).

Table 7: Regionally Significant Fauna

Common Name	Scientific Name	No. records
Salmon-striped Frog	*Lymnodynastes salmini*	2
Speckled Warbler	*Chthonicola sagittata*	3
Brown Treecreeper	*Climacteris picumnus*	1
Barking Owl	*Ninox connivens*	2
Koala	*Phascolarctos cinereus*	2
Yellow-bellied Glider	*Petaurus australis*	10
Narrow-nosed Planigale	*Planigale tenuirostris*	1
Common Brushtail Possum	*Trichosurus vulpecula*	1
Eastern Pebblemound Mouse	*Pseudomys patrius*	1

Regionally significant fauna species recorded during the survey are described below.

BAMM Criteria H Species

Salmon-striped Frog

This species was recorded once during a spotlight transect in a small patch of intact and healthy Brigalow in the Condamine State Forest. The BAMM report for the Brigalow Belt South (EPA 2008c) suggests that there may have been a decline in the occurrence of this species in the eastern parts of its range. Records from this survey are well to the west of the area in which the decline is thought to have occurred. Nevertheless, for the purposes of this report, the species is considered as likely to occur across all of the CSG Field.

Overall distribution encompasses central western NSW and adjacent parts of southern Queensland.

Speckled Warbler, Brown Treecreeper and Barking Owl

The Brown Treecreeper and Barking Owl were recorded only once during the survey. The treecreeper was found in the Wilkie Creek area to the extreme south-east of the project area and Barking Owls were recorded in Gurulmundi State Forest. It is highly likely that these species have restricted distributions in the CSG Field, although the characterization of these habitats would require further study. Both species may be sensitive to habitat fragmentation (EPA 2008c) and riparian corridors are thought to be a critical habitat for Barking Owls in the Brigalow Belt South Bioregion (EPA 2008c).

Speckled Warblers were recorded in the southern portion of the CSG Field where they occurred in relatively extensive tracts of natural vegetation. It is considered

that ongoing removal of understorey vegetation by fire and grazing may threaten this species in many areas (EPA 2008c).

Koala, Greater Glider, Yellow-bellied Glider and Brush-tailed Possum

These arboreal species were typically found in tracts of tall Spotted Gum (*Corymbia citriodora)* forest. The exception to this was the single record of the Brush-tailed Possum which was recorded in an open grassy eucalypt woodland in a broad riverine floodplain in the southern part of Gurulmundi State Forest.

Yellow-bellied Gliders were the most numerous arboreal marsupial seen during the survey and were recorded for the first time in Braemar State Forest. They were also recorded in Gurulmundi State Forest. The other species were recorded only once during the survey. Two koalas were observed in the same tree in Braemar State Forest during a spotlighting transect.

Discussions with local landholders indicated that koalas had been common in the area in the 1970's but were decimated by Chlamydia and have never recovered since that time. They might be expected to occur infrequently across the eucalypt forests and woodlands in the CSG Field.

Narrow-nosed Planigale

One Narrow-nosed Planigale was caught by pitfall trapping in a small remnant of Brigalow in Condamine State Forest. With only one record, it is difficult to predict the overall distribution or abundance of this species.

Eastern Pebblemound Mouse

During the course of the survey, one Eastern Pebblemound Mouse was captured in stony Spinifex woodland in Gurulmundi State Forest. This species also occurs to the north and east of the QCG Field and its distribution in the study area remains unknown. It is likely that it would be restricted to low hills with lateritic or pebbly substrates.

6.2.4 Least Concern Fauna

A complete list of fauna, including species recorded during the detailed surveys, is provided as **Attachment 10**. The total number of species recorded by databases and information sources consulted in this study was 262. This comprised 24 mammals, 140 birds, 72 reptiles, 15 amphibians, 10 fish and 1 butterfly.

Detailed fauna surveys conducted for this report recorded 213 species consisting of 32 mammal, 144 bird, 24 reptile, 13 frog and 1 butterfly species. Of these, three mammals, two birds and one amphibian were introduced species. A complete list of species identified during the surveys is provided in **Attachment 10**. All records have been submitted to the EPA WildNet database. The number of records for each fauna group (Kingdom) are summarized in **Table 8** below.

Table 8: Number of records for each fauna group

Kingdom	No. records
Frogs	120 (excludes multiple Cane Toad, *Rhinella marina* records)
Reptiles	78
Birds	983 (excludes introduced species)
Mammals	319 (excludes multiple counts at Little Red Flying Fox, *Pteropus scapulatus* colonies)

Of the 12 species of bats that were recorded on the survey, 9 were captured in bat traps and identified in the hand. One, the Little Red Flying Fox,

Pteropus scapulatus was noted during the day in camps, observed and heard feeding at night and one body was recorded on a barbed-wire fence. Two other bat species were identified from echo-location call sequences only. Both of these species, the Yellow-bellied Sheathtail Bat, *Saccolaimus flaviventris* and White-striped Mastiff Bat, *Tadarida australis* have highly distinctive echo-location calls as shown here from the survey results. In time-expanded sequences, *S. flaviventris* has a call with multiple harmonics and the fundamental at 21 to 22kHz. *T. australis* has a lower frequency call cantered at 15 to 18kHz and lacks the multiple harmonics (**Plate 1**). Both are not easily confused with other species.

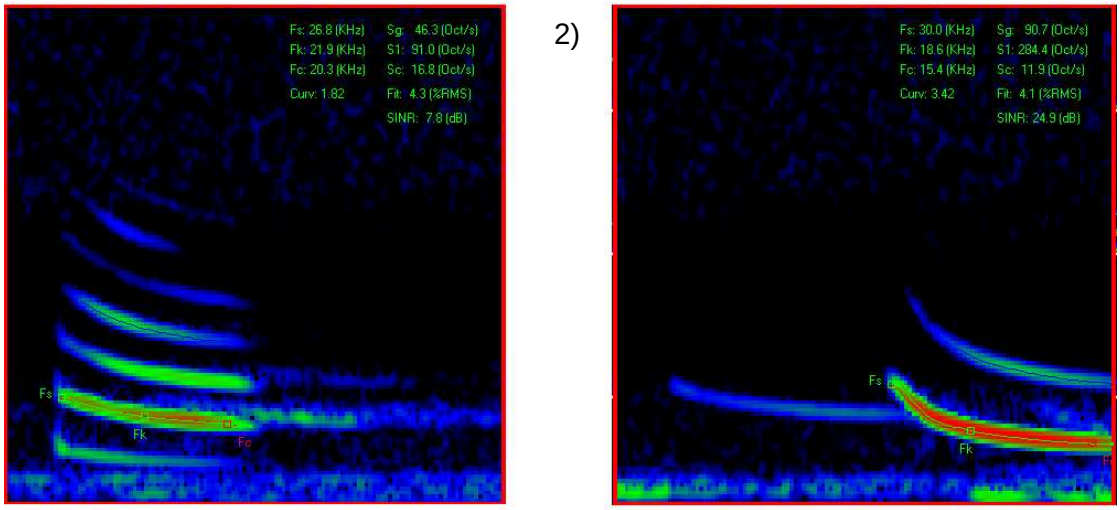


Plate 1 Time-expanded calls of 1) *S. flaviventris* and 2) *T. australis*.

The fauna surveys produced relatively few records for many fauna species while other species were recorded numerous times. It was the opinion of the survey team that very few records were obtained overall in comparison to the survey effort expended. Climatic conditions during the survey varied from hot and sunny to overcast and rainy. In most areas there was an abundance of ground water, and so it seems unlikely that climatic factors would have negatively influenced the survey result. The area has, however, experienced below average rainfall for the last few years. These results correlated with results of field assessments undertaken by the NSW National Parks and Wildlife Service in the NSW portion of this same bioregion (RACD 2002).

Survey results may also have been influenced by the trapping methodologies employed. At the time of the field survey Elliott traps were not available. It is unlikely that this would have affected the number of small mammals captured, but the use of Elliott traps may possibly have increased the number of reptiles sampled (Garden *et al*. 2007a).

6.2.5 Aquatic Fauna

Queensland Museum and WildNet records list 18 species of fish from the catchment in the QGC Field, two of which are introduced. All species are summarised in **Table 9** below.

One species, the Murray Cod, is listed as vulnerable under the EPBC Act and also as a Priority Taxa under BAMM Criteria H. The Southern Purple-spotted Gudgeon is also listed as Priority Taxa under BAMM Criteria H..

Table 9 Fish recorded in the catchment of the QGC Field.

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat
Bony Bream[1]	*Nematalosa erebi*			Recorded sightings from the Condamine River
Australian Smelt[1]	*Retropinna semoni*			Recorded in the Condamine river in an area west of Chinchilla
Goldfish*[1]	*Carassius auratus*			Recorded from the Condamine River and Wilkie Creek
Yellow-finned Eeltail Catfish [1]	*Neosilurus hyrtlii*			Recorded in the Condamine River and Lake Broadwater
Rendah's Catfish[1]	*Porochilus rendahli*			Known sightings within small tributaries of the Condamine River, such as Branch Creek.
Common Eel-tailed Catfish [1,]	*Tandanus tandanus*			Recorded sightings in the Condamine River, Lake Broadwater and Dogwood Creek.
Mosquito Fish*[1]	Gambusia holbrooki			Recorded in the Condamine River in areas in close proximity to Chinchilla.
Murray River Rainbowfish[1]	Melanotaenia fluviatilis			Recorded sightings in Brigalow Creek and the Chinchilla Weir
Fly-specked Hardyhead[1]	Craterocephalus stercusmuscarum			One recorded sighting in Brigalow Creek
Agassiz's Olive Glassfish [1]	Ambassis agassizii			One recorded sighting at Chinchilla Weir
Murray Cod[1,2]	Maccullochella peelii peelii		V	Recorded in the Condamine River in areas in close proximity to Chinchilla
Golden Perch[1]	Macquaria ambigua			Recorded in Condamine River
Spangled Perch[1]	Leiopotherapon unicolor			Recorded in Condamine and Balonne Rivers and Wilkie Creek
Western Carp Gudgeon[1]	Hypseleotris klunzingeri			Sightings in Condamine River and Brigalow Creek
Gudgeon Species[1]	Hypseleotris sp			Recorded sightings in Condamine River and Lake Broadwater
Silver Perch	Bidyanus biyanus			Condamine – not upstream of Dalby. Localised, rare.
Darling River Hardyhead	Cratercephalus amnicularis			Lower parts of the Balonne and McIntyre Rivers. Possibly occurs in the QCG Field.
Southern Purple-spotted Gudgeon[2]	Morurnda adspersa			Widespread in the upper parts of creek and river systems.

* Introduced species; [1] Qld Museum Records; [2] BAMM Report EPA 2002.

6.2.6 Introduced Fauna

According to desktop analysis eleven introduced species have been recorded within the wider area, including one amphibian, three birds, seven mammals and two fish. These species are included in **Attachment 10**, where they are denoted as introduced species by an asterisk.

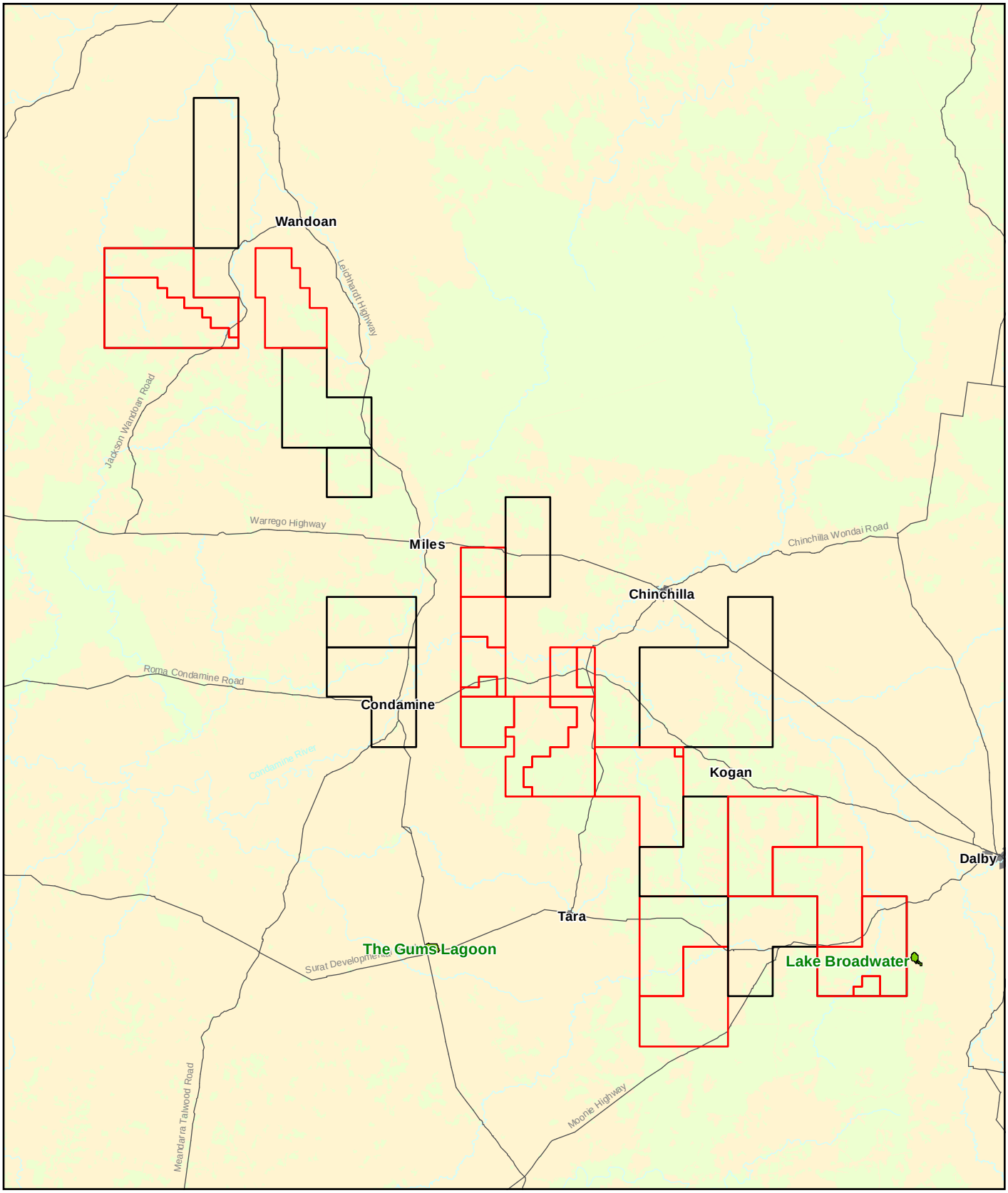
6.3 Wetlands

The Condamine and Balonne Rivers drain the region of the CSG Fields towards the southwest. Outside of the CSG Field, there are several nationally significant wetlands located on the lower Balonne River system including the Ramsar-listed Narran Lake Nature Reserve (which includes Back and Clear lakes) which is part of large terminal wetlands of the Narran River at the end of the Condamine system flowing out of Queensland. The Narran Lake Nature Reserve is approximately 450 km southwest of the QGC CSG Fields, in New South Wales.

In addition to the Narran Lake Nature Reserve there are two major wetlands within the Condamine catchment: Lake Broadwater Conservation Park and Resources Reserve 25km southwest of Dalby on the eastern boundary of PL269 and The Gums Lagoon 26km southwest of Tara outside the western boundary of ATP632 (**Figure 13**). Lake Broadwater is classified as a Palustrine system with Lacustrine wetlands on the outskirts and supports four wetland communities: (i) open water communities (ii) lake edge communities (iii) marsh communities and (iv) riparian communities. The Gums Lagoon is classified as a Palustrine system with a relatively undisturbed wooded swamp in a small reserve of similarly undisturbed woodlands and open forest (Australian Wetlands Database). The Gums Lagoon supports 79 identified species of birds some of which are afforded special status under JAMBA and CAMBA (Queensland National Parks and Wildlife Service [QNPWS] 2005). These bilateral agreements between Japan (JAMBA) and China (CAMBA) provide for the conservation of terrestrial, water and shorebird species that migrate between Australia and the respective countries.

The CSG Field area also contains a number of small areas mapped by the Queensland Herbarium mapping as wetlands (**Figure 9**). They are mapped as Not of Concern RE 11.3.27 (i.e. Palustrine wetland). These wetlands were not able to be accessed in the field due to landholder constraints but analysis of satellite imagery indicates that they are all small ephemeral wetlands, in most cases closely associated with, and in close proximity to significant watercourses. Satellite imagery also indicates that most are subject to grazing and are in an average to a degraded condition.

Aquatic flora and fauna species associated with these wetlands are discussed in **Sections 6.1.5** and **6.2.5** respectively.



Legend:

- CSG Fields - ATP
- CSG Fields - PL
- From the Directory of Important Wetlands

Source Note:

1:250,000 Topographic Vector copyright Geoscience Australia
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Coastal Wetland Vegetation

Projection UTM MGA Zone 56 Datum GDA 94

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Project	Queensland Curtis LNG Project	Title	From the Directory of Important Wetlands
Client	QGC - A BG Group business		
Drawn GH	Figure 13		
Approved xx	File No: QC02-T-MA-0020		
Date 25.02.09	Revision A		

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6.4 DERM Essential Habitat Areas

Essential Habitat areas are those areas mapped by DERM where EVR species have been known to occur and which exhibit essential habitat features for that species. According to DERM database searches at least 30 Essential Habitat areas occur within the CSG Fields. The EVR species known to occur within these Essential Habitat areas, their approximate location and the mining tenements within which they occur are set out in **Table 10**.

Table 10 Mapped Essential Habitat areas within CSG Field.

CSG Field Mining Tenement	Essential Habitat	Status (NCA)	Coordinates	
			Eastings	Northings
PL 274	*Acacia chinchillensis*	V	-27.3958	151.0079
PL 279	*Acacia chinchillensis*	V	-273659	151.0490
ATP 648	*Strophurus taenicauda* (Golden tailed gecko)	R	-273324	150.8349
	Acacia chinchillensis	V	-271931	150.6188
	Philotheca sporadica	V	-271931	150.6188
	Philotheca sporadica	V	-27.1089	150.6984
	Philotheca sporadica	V	-27.1420	150.6988
PL 273	*Chalinolobus picatus* (Little pied bat)	R	-27.1405	150.9040
	Strophurus taenicauda (Golden tailed gecko)	R	-27.1090	150.7955
	Philotheca sporadica	V	-27.1661	150.8354
	Philotheca sporadica	V	-27.1146	150.8942
	Philotheca sporadica	V	-27.1090	150.7955
PL 261	*Eucalyptus curtisii*	R	-27.3329	150.6690
ATP 676	*Jalmenus evagoras* (Imperial hairstreak)	V	-26.9764	150.6406
	Jalmenus evagoras (Imperial hairstreak)	V	-26.9810	150.6517
PL 263	*Acacia wardelli*	V	-26.9143	150.2713
	Paradelma orientalis (Brigalow scaly-foot)	V	-26.9198	150.2434
	Nyctophilus timoriensis (Eastern long eared bat)	V	-26.9198	150.2434
	Nyctophilus timoriensis (Eastern long eared bat)	V	-26.9310	150.3461
	Nyctophilus timoriensis (Eastern long eared bat)	V	-26.9841	150.2664
	Chalinolobus picatus (Little pied bat)	R	-26.9964	150.3002
PL 212	*Chalinolobus picatus* (Little pied bat)	R	-26.9143	150.2713
ATP 574	*Mycromyrtus carinata*	E	-26.4778	150.0037
	Mycromyrtus carinata	E	-26.4582	149.9177
	Mycromyrtus carinata	E	-26.4209	149.9704
	Mycromyrtus carinata	E	-26.4211	149.9367
	Mycromyrtus carinata	E	-26.4009	149.9219
	Acacia curranni	V	-26.4152	150.0023
	Acacia curranni	V	-26.4152	150.0023
	Calytrix gurulmundis	V	-26.4077	149.9333

These EVR flora and fauna species were targeted during the field surveys (**Section 6.1.6**). For the purposes of this assessment the assumption will be made that all areas mapped by DERM as Essential Habitat areas are in fact Essential Habitat areas.

6.5 Environmentally Sensitive Areas

6.5.1 Bioregional Planning Assessment Values

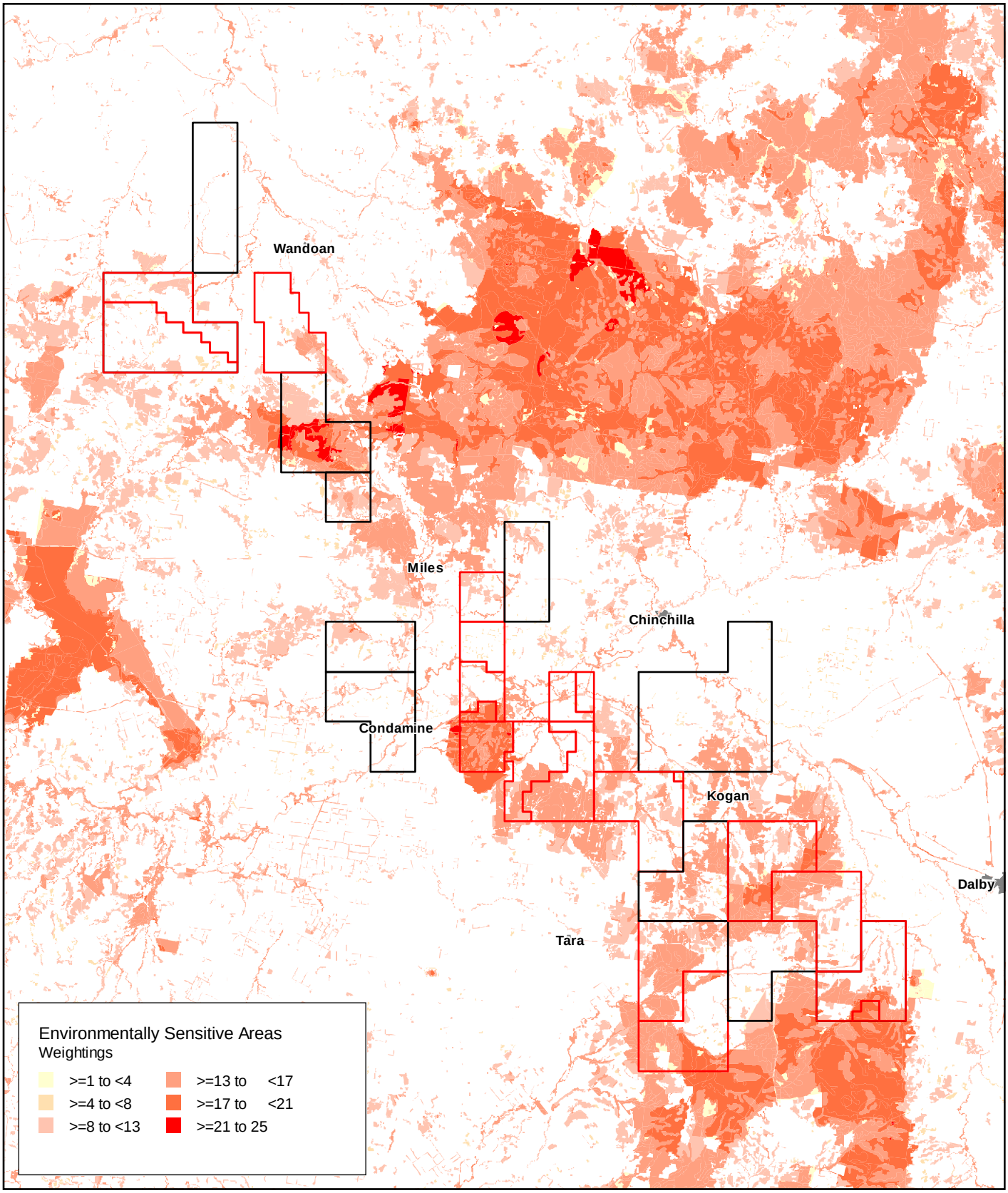
Conservation values across the CSG Field vary markedly as a result of past and present land uses and the intensity of current rural residential, cropping and grazing regimes. Conservation values have been appraised in accordance with the EPA's Biodiversity Assessment and Mapping Methodology (BAMM) and also taking into account Environmentally Sensitive Areas as defined by the EPA in their Guideline "Assessment and Approval Process for Environmental Authorities for Petroleum Activities". Incorporated in the BAMM methodology, is specific appraisal of habitat for EVR taxa, ecosystem values, RE status (VM Act) which generally incorporates threatened Ecological Communities (EPBC Act 1999), the size of remnant vegetation tracts, relative ecosystem size, ecosystem diversity, the connectivity and buffering of REs, habitat for BAMM priority taxa, special biodiversity values and threatening processes.

Most of the BAMM criteria (A - G) are assessed through appraisal of a combination of criteria derived from GIS-based spatial data. BAMM Criteria H to K are derived through consultation with expert panels, the members of which have specific expertise in various taxa occurring in the bioregion. Field surveys of flora and fauna carried out for the preparation of this technical report, provided additional site records and information relevant to these criteria. These records included EVR and Priority Taxa (BAMM Criteria A and H respectively) and the identification of Special Biodiversity Value areas (Criteria I). Based on the analysis of these criteria and those (and the methodology) described in **Section 5.3** a map of Environmentally Sensitive Areas has been developed (**Figure 14**).

Summaries of EVR and Priority Taxa have been provided in previous sections (Flora: **Table 4**, **Sections 6.1.2 – 6.1.4**; Fauna: **Tables 6 & 7, Sections 6.2.2 – 6.2.3**). The following are additional values assessed and included in this study under Criteria I.

6.5.2 Additional Flora Values

- All areas of remnant vegetation in Landzone 7 within the CSG Fields. This RE is of particular importance as it contains a significantly large number of EVR taxa in the Gurulmundi area and also in the southern areas of the CSG Fields where it supports *Philotheca sporadica* and other EVR plants. This Landzone comprises open gravelly hill tops (lateritic duricrust) and is frequently targeted for gravel extraction
- Parts of Mardela State Forest mapped as RE 11.3.2 but which this study found to be RE 11.3.1, have been afforded the elevated status of Endangered
- Condamine State Forest which contains several EVR species and is considered to be an area with high species richness
- Braemar State Forest which was appraised as being in average condition due to fire and to a lesser extent, logging and recreational vehicle usage. The area does however contain a number of high quality examples of Endangered REs and very few weeds. These factors, together with the relatively large size of the State Forest, qualify it as a refugial area



Legend:

CSG Fields - ATP

CSG Fields - PL

Source Note:

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Projection UTM MGA Zone 56 Datum GDA 94

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Project: **Queensland Curtis LNG Project**

Client: **QGC - A BG Group business**

Title: **Environmentally Sensitive Areas (Weighted)**

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Drawn	GH	**Figure**	**14**
Approved	xx	File No:	QC02-T-MA-0021
Date	26.02.09	Revision	A

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- Semi-evergreen Vine Thicket protected under EPBC Act and VM Act is exceedingly rare in the CSG Fields, occurring only in the Wooleebee Creek area and in northern parts of, and further north of, Gurulmundi State Forest. It is afforded additional status as it contains taxa at the southern geographical extent of their range, and
- Areas mapped as ephemeral wetlands (RE 11.3.27) on the assumption that these areas have extant values (not able to be assessed in the field due to landholder constraints).

6.5.3 Additional Fauna Values

- Riparian corridors with native vegetation. Within the tenements there are many small creeks and floodout areas, some of these are still well vegetated. They include the environs of Wambo Creek, Wilkie Creek, Moramby Creek, Braemar Creek and the Condamine River. These areas contain a high proportion of hollow trees and are important dry season refuges and breeding areas.
- Gurulmundi area, in particular because:
  - Topography over most of the CSG Field is relatively flat, however there are significant escarpments above steep boulder-strewn creeklines in the Gurulmundi State Forest area which are important refuges and also likely to provide habitat for uncommon species. This was the only area within the CSG Fields where the east-coast form of the Wallaroo (*Macropus robustus robustus*) was recorded
  - Bat calls recorded in this area may be those of the Large-eared Pied Bat (*Chalinolonbus dwyeri*) and footprints seen in the several caves may be those of a Northern Quoll (*Dasyusus hallucatus*). Further survey effort would be required to confirm these records, however, for the purposes of this assessment a precautionary approach will be taken and therefore it will be assumed that these species occur in the area, and
  - Based on all known values, the Gurulmundi area qualifies as an important fauna refuge and area of high species richness.

6.5.4 Environmentally Sensitive Areas Mapping

Based on the analysis of these criteria and the methodology described in **Section 5.3** a map of Environmentally Sensitive Areas has been developed (**Figure 14**)

7.0 POTENTIAL IMPACTS

7.1 Reversible and Non-reversible Impacts

Once infrastructure has been developed, there is potential to allow vegetation to re-establish over a portion of the area originally cleared. Bore pads are 10 000m^2 (1 ha) in extent for construction but can be revegetated around the edges provided that 5000 m^2 around the established well remains vegetation free. Similarly road verges can be allowed to revegetate once wide clearance vehicles used in construction are withdrawn. Where flowlines are laid, a portion of the ground surface can be allowed to revegetate. Keeping a narrow strip of ground over the flowline, free of trees and shrubs may be all that is necessary to protect it from potential root damage and facilitate ongoing inspection and necessary maintenance.

With the typical well life being up to 25 years, wells and the associated flowlines and access roads will be progressively rehabilitated over the life of the Project. Rehabilitation activities will commence sequentially at ramp-down/cessation of commercial production for depleted wells.

As such, subject to landholder property management practises, it is expected that over the medium term (20 - 50 years) significant portions of the originally modified areas will be rehabilitated and allowed to naturally regenerate.

Longer-term, the CSG Field is likely to be decommissioned within several decades. Subject to the exception that landholders may choose to manage their properties in a manner that inhibits natural regrowth; the impacts associated with the clearing of vegetation for construction and maintenance are considered to be reversible in the long term.

7.2 Potential Impacts on Threatened Ecological Communities and Regional Ecosystems

Queensland Herbarium RE mapping indicates that approximately 50% of the CSG Field supports remnant vegetation. The majority of this consists of Eucalypt woodlands and forests. Small narrow fragmented stands of Brigalow are mapped as occurring on roadside verges and/or as wind breaks along the margins of pasture or cropping paddocks. Some clearing of these remnant vegetation communities will be required. Mostly, this will involve the clearing of relatively narrow, linear corridors and pad footprints in Eucalypt communities.

In order to place the potential impacts of the project within a bioregional perspective, the following estimates have been made:

- The total known area of EPBC Listed Ecological Communities within the CSG Field and the estimated extent of area, and percentage of area that may be impacted. This estimate coincides with (and is not additional to) the areas estimated for Endangered, Of Concern and Not of Concern REs under the VM Act
- The total area of VM Act Endangered, Of Concern and Not of Concern REs within the CSG Field and the estimated extent and percentage of the total area that may be impacted, and
- Comparisons are also made with the overall extent of these RE categories within the Bioregion.

These estimates are provided in **Table 11**. It must be emphasised that these are worst vegetation loss scenarios and that actual loss should be far less than this when mitigation measures proposed in **Section 8** are implemented. Note that the

calculations set out in **Table 11** are based on the assumption that any unavoidable clearing of Endangered and Of Concern REs (likely to be of a very minor extent) will be compensated for through the creation of environmental offsets. For the purposes of the calculations shown in **Table 11**, no account has been taken of the recommended offset activities for Not of Concern REs.

Table 11 Worse Case Vegetation Loss

RE Status	Estimated extent within the QGC Fields (Ha)	Worse case vegetation loss (Ha)	Estimated extent remaining (Ha)	Estimated % cleared in the QGC Field	Estimated % cleared in the Bioregion
EPBC Listed*	4,039	0#	4,039	0	0
Endangered	4,415	0#	4,415	0	0
Of Concern	7,403	0	7,403	0	0
Not of Concern	159,434	4,624^	154,811	<3	.105
TOTAL	171,253	4,624^	166,415	<3	.032

* EPBC Listed Ecological Communities coincide with (and are not additional to) VMA Endangered, Of Concern and Not of Concern REs.
# Including offset activities where clearing unavoidable (very minor extent)
^ Excluding consideration of offset activities

7.2.1 Potential Impacts on Threatened Ecological Communities

The CSG Field contains two threatened Ecological Communities listed as Endangered under the EPBC Act (**Table 3**) these are:

- Brigalow woodland / open forest communities – REs 11.3.1, 11.4.3, 11.4.7, 11.4.10, 11.9.5, 11.9.6, and
- Semi-evergreen vine thicket communities – REs 11.8.3 and 11.9.4.

According to existing mapping the majority of these communities occur in small narrow fragments along fencelines, creeks and roadsides. Field surveys of these areas indicate these fragments are generally degraded as a result of edge effects which include weed invasion, disturbance from livestock and fire damage.

It is estimated that these Threatened Ecological Communities make up 4,039 ha of the CSG Field. This equates to approximately 0.19% of these REs found within the Bioregion.

While Threatened Ecological Communities will be avoided where possible other potential impacts that could arise from the proposed CSG activities include:

- Direct loss due to clearing (where unavoidable)
- Introduction and spread of declared and environmental weeds
- Introduction or proliferation of pest fauna species, and
- Changes to fire regimes, in particular increased fire regimes due to higher to weed biomass along cleared alignments.

Due to the closed nature of Brigalow and SEVT communities these areas are particularly sensitive to indirect impacts such as fragmentation, weed invasion and

altered fire regimes. The invasion of these communities by exotic weed species (e.g. Buffel Grass) provides increased fuel loads which can lead to the increased occurance of wildfire and the subsequent damage to the lower tree layer.

7.2.2 Potential Impacts on Endangered Regional Ecosystems.

The VM Act listed Endangered REs present within the CSG Field are the same as the EPBC Listed Ecological Communities discussed above, with the exception of the Eucalypt Woodland RE 11.4.12 which is not EPBC listed.

The total area of Endangered REs mapped as present within the CSG Field is approximately 4,415 ha. This amounts to approximately 0.19% of that which occurs within the bioregion (**Table 3**).

As for the EPBC listed communities, areas of RE 11.4.12 will be avoided where possible. Any unavoidable area of RE 11.4.12 will be compensated for through the establishment of an appropriate environmental offset.

As a result of the long narrow nature of these RE 11.4.12 remnants (**Figure 5**), they are particularly susceptible to edge effects such as the invasion of declared and environmental weeds. However, provided appropriate weed control mechanisms are put in place it is unlikely that these Eucalypt woodlands will be adversely impacted by these indirect impacts.

7.2.3 Potential Impacts on Of Concern Regional Ecosystems.

Six Of Concern REs occur within the CSG Field (i.e. REs 11.3.2, 11.3.3, 11.3.4, 11.3.17, 11.9.7, and 11.9.10; **Table 3**). According to existing mapping these Eucalypt woodland communities occur in long narrow patches throughout the CSG Field usually in association with watercourses (**Figure 6**). According to Queensland Herbarium RE mapping the area of these REs found within the CSG Field is a small proportion of that which is found in the Bioregion (i.e. <1%).

As the Of Concern communities that occur within the CSG Field make up a small proportion of that which occurs within the bioregion in addition to the fact that disturbance will be minimised near watercourses (See **Section 8**), it is considered unlikely that these Of Concern communities will be adversely affected by the proposed developments.

The proposed developments could potentially increase the exposure of these communities to edge effects such as weed invasion and the introduction of pest animals. However, provided that appropriate weed and pest control mechanisms are put in place it is considered unlikely that these Of Concern vegetation communities will be significantly impacted by these indirect impacts.

7.2.4 Potential Impacts on Not of Concern Regional Ecosystems.

According to existing mapping 20 VM Act listed Not of Concern REs are present within the CSG Field. These include:

- 15 Eucalypt woodland communities – REs 11.3.14, 11.3.18, 11.3.19, 11.3.26, 11.5.1, 11.5.4, 11.5.5, 11.5.20, 11.5.21, 11.7.4, 11.7.6, 11.7.7, 11.10.1, 11.9.9, and 11.10.9
- One Riparian woodland community – RE 11.3.25
- One Freshwater wetland community – RE 11.3.27
- One Shrubland community – RE 11.7.5
- One Acacia woodland community – RE 11.7.2, and
- One Semi-evergreen vine thicket community – RE 11.8.3.

The total area of the Not of Concern REs found within the CSG Field is estimated to be approximately 159,434 ha, this equates to approximately 3.6% of these REs found within the bioregion (**Figure 7**). The worst case clearing footprint for these Not of Concern REs within the CSG Field is estimated at <3%. This amounts to approximately 1,594 ha which makes up 0.04% of these form of REs found within the bioregion. However, as remnant vegetation will be avoided where possible by siting infrastructure in previously cleared areas it is expected that the actual area of Not of Concern communities to be cleared will be less than this worst case estimate. The Riparian Woodland Community RE 11.3.25 is considered to have high conservation value and generally occurs along alluvial plains associated with watercourses. As disturbance will be minimised near watercourses (see **Section 8**) the areas of RE 11.3.25 that may be required to be cleared will be significantly less than the estimated 3%

7.2.5 Other Potential (non-clearing) Impacts on Threatened Ecological Communities and Regional Ecosystems

The project could potentially lead to the protection and improvement of environmental values in the area through conservation focussed offsets and land management initiatives (e.g. fire management and infrastructure, weed and pest management, livestock exclusion and fencing).

Potential detrimental impacts include:

- The movement of machinery and vehicles between areas, which has the potential to spread weeds including a number of environmental and declared noxious species, such as Buffel Grass, Parthenium Weed and Giant Rat's-tail Grass
- Introduction or proliferation of pest fauna species
- The activities of machinery and construction operations may increase the likelihood of wildfires
- Initial drilling activities result in the production of associated water which is very mildly saline (generally 2,000-5,000 ppm). Vegetation in the vicinity of the wells may be impacted if water tables are affected or if extracted water flows into nearby vegetation, and
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

7.2.6 Potential Impacts on EVR Flora Species

All EVR flora species identified in the CSG Field may be subject to some of the potential impacts described in the previous section, namely:

- Clearing for the construction of roads and pads for gas drilling and extraction
- The activities of machinery and construction operations may increase the likelihood of wildfires, and
- The project could potentially bring about beneficial affects through the establishment of environmental offsets and land management initiatives, aimed at protecting and improving knowledge of the distribution and threats to EVR flora species in the CSG Field.

There is higher potential for clearing activities within Landzone 7 to impact particular EVR flora species (i.e. *Acacia curranii , Calytrix gurulmundensis, Eucalyptus curtisii, Micromyrtus carinata* and *Philotheca sporadica*).

Additionally, the aquatic EVR species *Aponogeton queenslandicus*, *Eleocharis blakeana* and *Fimbristylis vagans* while not recorded in the CSG Field has the potential to occur within temporary waterbodies. This species has the potential to be impacted by:

- Clearing
- Any sedimentation or nutrification of watercourses
- Inadvertent release of saline waters (initial drilling and gas extraction activities result in the production of water which is very mildly saline, generally 2,000-5,000 ppm), and
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

It is noted that changes to surface water level tables are unlikely to occur as a result of the Project (Golder, 2009b).

The potential for weed species to significantly impact any of EVR flora species within the CSG Field is considered to be low due to the fact that either:

- The niches in which they occur are generally not suitable for the establishment of significant populations of exotic species, or
- Where this is not the case, the preferred habitats are generally already dominated by Buffel Grass, Green Panic or other pasture grasses.

Table 12 summarises the potential for each threatened flora species to be impacted by the proposed activities with and without mitigation measures. Mitigation measures to address these potential impacts are detailed in **Section 8**.

Table 12 Potential for EPBC and NC Act Listed Flora Species to be Impacted

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
Waajie Wattle	*Acacia barakulensis*	V[2]	Found nearby at Barakula SF only	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
Brown Wattle	*Acacia brunioides*	R[2]	Restricted to some mountain peaks in the southern Moreton district (Stanley and Ross, 1983). Commonly found sandy, poor soils derived from Granite geology (PlantNET)	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Acacia chinchillensis*	V[1 and 2]	Sandy soils. Widespread but uncommon.	Moderate	Clearance Surveys, Fire Management	Low (easily avoidable)
Curly-bark Wattle	*Acacia curranii*	V[1 and 2]	Only known from Gurulmundi wildflower area north of Miles. The majority within RE 11.7.5.	High (restricted species)	Clearance Surveys, Fire Management	Potentially High in Landzone 7 within Gurulmundi State Forest, low elsewhere
Tara Wattle	*Acacia lauta*	V[1 and 2]	Found from Tara to Inglewood 1) Property "Marron Glen", 2) 15km north of Tara and 3) 16km east of Tara. Recorded within and in the vicinity of the south-eastern areas of the CSG Field, just north of Tara.	Moderate	Clearance Survey, Fire Management	Low (easily avoidable)
None known	*Acacia tenuinervis*	R[2]	Associated with red ridges. Recorded North of Glenmorgan along loamy ridges with spotted gum and narrow-leaf ironbark (Lester 2008)	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Acacia wardellii*	V[1 and 2]	Ridge crests with loamy or gravely soil. Coloniser of	Moderate	Clearance Survey, Fire Management	Low (restricted habitat type, easily avoidable in most

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
			disturbed areas – Thomby Range and a few ridges east of the Condamine.			cases)
Queensland Lace Plant	*Aponogeton queenslandicus*	R[2]	Not known in CSG Field. Temporary wetlands associated with watercourses	Moderate	Avoidance of watercourses, Clearance Survey, sediment and erosion controls,	Low (low numbers anticipated, easily avoided)
Ooline	*Cadellia pentastylis*	V[1 and 2]	Clay plains, sandstone ridges. Localised and patchy distribution in Gurulmundi and Barakula areas.	Moderate	Clearance Survey, Fire Management	Low (low numbers anticipated, easily avoided)
Gurulmundi Fringe Myrtle	*Calytrix gurulmundensis*	V[1 and 2]	Found on lateritic sandstone ridges. Localised and patchy distribution in Gurulmundi and Barakula areas.	High (restricted species)	Exclusion areas at Gurulmundi. Clearance Surveys, Fire Management	Potentially High in Landzone 7 within Gurulmundi State Forest, low elsewhere
None known	*Commersonia argentea*	V[1]	Stony ridges, north of Chinchilla	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Cryptandra ciliata*	R[2]	Know record at Gurulmundi State Forest (Qld Herbarium)	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Denhamia parvifolia*	V[1 and 2]	Not known in CSG Field. Found in semi-evergreen vine thickets. Brown loam or clay loam soils.	Moderate	Clearance Survey, Fire Management	Low (low numbers anticipated, restricted habitat type, easily avoided)
None known	*Diuris tricolor (sheaffiana)*	V[1]	Sandy soils, often in Callitris woodlands. Primarily a NSW species with scattered records in Qld.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
Blake's Spikerush	*Eleocharis blakeana*	R[2]	Known in Wet poorly drained soils; Records along Auburn Rd Chinchilla and Lake Broadwater	Moderate	Avoidance of watercourses, Clearance Survey, sediment and erosion controls,	Low (low numbers anticipated, easily avoided)
Plunkett Mallee	*Eucalyptus*	R[2]	Eucalypt forests, woodlands	Moderate	Clearance Survey, Fire	Low (low numbers anticipated,

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
	curtisii		and shrublands on rocky slopes or on low poorly drained sites (Qld Herb., 2001).		Management	easily avoided)
Shiny-leaved Ironbark	*Eucalyptus virens*	V[1 and 2]	Type collected from Gurulmundi SF. Restricted to Landzone 7.	High	Clearance Survey, Fire Management	Potentially High in Landzone 7 within State Forests, low elsewhere
None known	*Fimbristylis vagans*	R[2]	Wet creek/drainage lines Wetland plant recorded in the nearby Lake Broadwater Area	Moderate	Avoidance of watercourses, Clearance Survey, sediment and erosion controls,	Low (low numbers anticipated, easily avoided)
None known	*Gonocarpus urceolatus*	V[2]	Recorded near Chinchilla on heavy loam soils.	Moderate	Clearance Survey, Fire Management	Low (low numbers anticipated, easily avoided)
None known	*Grevillea singuliflora*	R[2]	Known habitat is Barakula S F	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Homopholis belsonii*	V[1] / E[2]	Not known in CSG Field. Dry woodland on sandy soils.	High	Clearance Survey, Fire Management	Low (low numbers anticipated, easily avoided)
None known	*Homoranthus decumbens*	V[1 and 2]	Found in two separate locations 1) Blackdown Tablelands and 2) State Forest 302, north of Chinchilla.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Melaleuca groveana*	R[2]	Occurs on ridges, high mountain slopes and mountain summits in heaths and eucalypt woodland and forests with heath understories (DNR, 1999).	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
Gurulmundi Heath-myrtle	*Micromyrtus carinata*	E[2]	Type collected from Gurulmundi SF. Restricted to Landzone 7.	High	Exclusion Areas at Gurulmundi. Planning and Clearance Surveys, Fire Management	Potentially High in Landzone 7 within Gurulmundi area, low elsewhere
None known	*Micromyrtus*	E[2]	Found within the area by Qld	Low (not known in	Clearance Surveys	Low (easily avoided)

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
	patula		Herbarium	the CSG Field)		
None known	*Notelaea pungens*	R[2]	Known herbarium records Barakula S F Chinchilla	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Philotheca sporadica*	V[1 and 2]	On residual lateritic rises. north of Tara and east of Kogan. Widespread but patchy distribution in southern parts of CSG Field where it is restricted to Landzone 7.	High	Planning and Clearance Surveys, Fire Management,. Permitting and offsets where impacts unavoidable (in Landzone 7 areas in the southern parts of the CSG Field limited clearing across large patches may be required for linear infrastructure – avoidable for well sites)	Low (restricted habitat type, avoidable for well sites, offsets required)
None known	*Rutidosis glandulosa*	R[2]	Recorded from Barakula State Forest (Kokubugata & Holland 2002)	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Rutidosis lanata*	E[2]	Occurs in Eucalypt and Acacia forests. Two populations known 1) near Jackson and 2) near Meandarra.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Solanum papaverifolium*	E[2]	Heavy black soils (Stanley and Ross, 1986).	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Solanum stenopterum*	V[2]	Cracking clay soils in vine thickets, woodlands and grassy plains.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)

***Status:** [1]: Commonwealth (EPBC) listed: **E** = Endangered; **V** = Vulnerable

[2]: State (NC Act) listed: **E** = Endangered; **V** = Vulnerable; **R** = Rare.

As detailed in **Table 12**, the unmitigated potential for the Project to impact on EVR flora is:

- High for 6 species, and
- Moderate for ten species.

Table 12 also describes how the implementation of mitigation measures detailed in **Section 8** would enable the Project to avoid significant impacts to all EVR flora. However, this assumes that CSG activities are largely excluded from Gurulmundi areas (**Section 8** recommends all CSG activities be excluded from Gurulmundi areas for flora and fauna reasons). If this is not the case, there would be potential for significant impacts on the two EVR flora species *Acacia curranii* and *Calytrix gurulmundensis*.

7.2.7 Potential Impacts on Regionally Significant Flora Species

Of the four Regionally Significant flora species known to occur within the CSG Field (*Acacia aprepta*, *Acacia shirleyi*, *Dodonaea macrossanii* and *Corymbia bloxsomei*), the first three are relatively widespread and common in the area. As such the proposed clearing is unlikely to have any significant effect on local or regional populations of these species.

Corymbia bloxsomei was only observed in smaller numbers fringing the ecotone around RE 11.7.5 within the Gurulmundi State Forest. Without adequate mitigation measures there would be some potential for clearing within this specific area to have a significant impact on this species.

7.2.8 Potential Impacts on Least Concern Flora

Provided that the clearing footprint within any given vegetation area does not exceed the estimated 3%, there is little potential for this clearing to have a significant impact on Least Concern flora species.

Potential beneficial affects associated with the Project include the protection and improvement of general environmental values across the CSG Field through conservation focussed offsets and land management initiatives.

7.2.9 Aquatic Plants

The proposed development has the potential to impact on aquatic ecosystems and a range of aquatic plant species through:

- Direct clearance and disturbance by machinery
- Indirect impacts associated withaltered water, sediment and nutrient flows which could occur if watercourse disturbance is not effectively managed, and
- Inadvertent release of associated water.

Section 6.3 provides a summary of major and minor wetlands in the region which are known to contain a large diversity of aquatic plants. The potential for the Project to impact upon wetlands is discussed in **Section 7.10**.

Most aquatic species present in the CSG Field are widespread and abundant, so are unlikely to be significantly impacted.

EVR species the Queensland Lace Plant (*Aponogeton queenslandicus*), Blake's Spikerush (*Eleocharis blakeana*) and *Fimbristylis vagans* may occur in temporary

wetlands associated with watercourses. In the absence of appropriate mitigations there would be moderate potential that these EVR species may be adversely impacted by the CSG activities.

However; provided that the mitigation measures as outlined in **Section 8.0** are employed, no significant direct or indirect impacts to aquatic ecosystems or any aquatic plant species are considered likely.

7.2.10 Potential Impacts Associated with Environmental and Declared Noxious Weeds

Construction and maintenance of the wells and associated infrastructure has the potential to introduce new weeds and spread existing ones.

Of particular significance to landholders will be the potential to introduce and spread declared and agricultural weeds, including those already present within parts of the CSG Fields. Introduction and spread of declared weeds can render land less productive and in some cases have serious health impacts on livestock and people. Parthenium Weed is of particular interest to landholders and the community due to its potential impacts on agricultural productivity and human health. Parthenium Weed is not currently known within the CSG Field but is believed to occur in nearby areas.

Of the two declared weeds that are known to occur in the CSG Field (Mother of Millions and Prickly Pear), there is potential for Project activities to spread these into currently clean areas through movement of vehicles, machinery, equipment, materials and fill. Both species have the potential to cause agricultural and environmental degradation, particularly in alluvial soil areas (Land Zone 3).

Construction and maintenance activities in the CSG Field also have the potential to spread environmental weeds into ecosystems that are currently in a natural condition. Of particular concern is Buffel Grass (*Cenchrus ciliaris*). This species is an introduced and highly valued pasture grass in many areas, however, it has the potential to spread into native communities and conservation areas where it out-competes native species. It often causes an increase in biomass which drastically biases fire regimes towards much more intense and frequent fire events which can destroy natural ecosystems. The grass itself also provides very little nutritive or forage value for wildlife and therefore areas dominated by the Buffel grass can quickly become biological deserts.

Other environmental weeds of significance are Castor Oil (*Ricinus communis*), Mexican Poppy (*Argemone ochroleuca*), Mimosa Bush (*Acacia farnesiana*) and Guinea Grass (*Megathyrsus maximus*) .

Good weed hygiene practices should be adopted to minimise the introduction or spread of declared, agricultural and environmental weeds in the QGC Field. Recommendations aimed at controlling the introduction and spread of weed species are provided in **Section 8.0**.

7.3 Potential Adverse Impacts on Fauna

Clearance of native vegetation will be required for the construction of roads, pipelines, well site pads and other infrastructure. The size requirements of these clearance pads for infrastructure is greatest during development phase and reduces once production is established, Based on this, it is expected that impacts

associated with the clearing of vegetation will be reduced over time as cleared areas partially revegetate.

Overall proportions of vegetation disturbance is expected to be low as it is estimated that only 3% of vegetation across the entire CSG Field will be required to be cleared (**Section 7.2**).

Project infrastructure locations will be selected to avoid areas identified as having highest significant conservation values (**Section 8**). Nevertheless, some potential impacts would remain and these include the following:

- Removal of habitat such as mature vegetation, hollow-bearing trees and fallen logs, and therefore loss of nesting, shelter and foraging resources
- Fragmentation of habitat due to flow line and access road construction. These features may act as movement barriers, particularly to fossorial[1] species, and alter movement patterns. They may also limit access to dry season fauna refuges associated with riverine environments
- Access for predators – dingoes and to a lesser extent, foxes and cats are known to follow roads and tracks as they provide easy access paths. This may open up new habitats and expose fauna to elevated predation risks
- The establishment of environmental weeds, particularly Buffel grass, have the potential to destroy natural fauna habitats through altered fire regimes and removal of fauna food resources
- Noise and increased human activity, particularly during site development may restrict species movements and limit access to food or other resources
- The potential for road kills along access tracks will elevate mortality risks for some species
- Sedimentation and nutrification of aquatic habitats, and
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

Discussion of each of these potential impacts follows.

7.3.1 Removal of Tree Hollows and Vegetation

Removal of mature vegetation reduces feeding resources and shelter for native fauna species. While it is recognised that the proposed loss of mature vegetation would not be significant, some parts of the CSG Field have been heavily cleared and are now severely fragmented.

An important potential impact on fauna is the loss of hollow-bearing trees. A large number of Australian vertebrate fauna species are dependent on tree hollows for shelter and nesting, including (amongst others) parrots, owls, possums, gliders and bats (Gibbons and Lindenmayer, 2002). Mature trees with hollows are a limited resource in this region and are largely confined to riparian corridors and areas of mature, intact forest. During the initial tertiary surveys birds such as galahs were observed nesting in degraded fragments of roadside vegetation where large hollows existed. Thus all forest and woodland fragments with large trees should be considered as potentially important fauna habitat. The formation of hollows suitable

[1] burrowing

for use by fauna does not occur until eucalypts are at least 120 years. Therefore, the replacement of lost hollows may not occur for very long periods.

Fallen logs and dead timber on the ground and understorey vegetation provide shelter (either underneath timber or within hollow logs) and food resources for a broad range of small ground-dwelling fauna. These include, but are not exclusive to, native rodents, dasyurid marsupials, bandicoots, lizards, snakes, frogs, and some birds. For example, during the detailed fauna surveys Rufous Bettongs were only recorded in association with dense understorey vegetation. The loss or removal of fallen timber and understorey vegetation severely reduces the abundance and diversity of small ground-dwelling fauna. Impacts from removal of dead timber and understorey vegetation will reverse over time as affected areas revegetate but reduction in abundance of some species is likely to occur in the short to medium term.

7.3.2 Habitat Fragmentation

The CSG Field includes riparian Eucalypt woodlands and forests which have important fauna values as refugia for wildlife during dry periods and as corridors, facilitating the movement of migratory and nomadic species. Such refugia and corridors are particularly important because much of the wider environment of the study corridor is fragmented as a result of clearing for agriculture. Additionally these watercourses are often the only source of water during the dry season and therefore enable populations to persist in a dry and largely cleared landscape. Fragmentation and disturbance of these habitats may be reversible in the medium to long term by natural revegetation and habitat rehabilitation or specific programs aimed at restoring habitat.

Whilst it is recognised that the vast majority of vegetated areas are already extensively criss-crossed with fire-breaks, fencelines and roads, the clearing for proposed project infrastructure will increase the degree of existing habitat fragmentation. This impact is somewhat reduced by the fact that the proposed clearing will generally consist of narrow, linear strips (as access tracks and flowlines are developed). This impact will be more significant in relatively intact vegetation areas (particularly in State Forests) and less significant where ground and shrub layers have been degraded by existing land uses, such as grazing, and fire and weed impacts.

Fragmentation and disturbance of these habitats may be reversible in the medium to long term by revegetation and habitat rehabilitation programs.

7.3.3 Access by Predators

Predators such as dingoes, and to a lesser extent, foxes and cats, are known to use roads and tracks extensively as they provide rapid and unrestricted access across the landscape and the relative lack of contact with vegetation also ensures minimal parasite contact. Tracks also have the potential to open up dense understorey habitats which may provide important refugia for fauna.

7.3.4 Environmental Weeds

The movement of machinery and vehicles may facilitate the spread of weeds species, some of which are highly invasive and once established are very difficult and costly to eradicate. Weeds are discussed in **Section 7.2.10** above. Of particular concern in relation to potential impacts on native fauna is the

environmental weed Buffel grass (*Cenchrus ciliaris*). This grass has the potential to spread and out-compete native species in a variety of habitat types. Its increased biomass may also predispose infested habitats to more intense and frequent fire events. It is also of very little nutritive value to fauna and seeds are inedible to many grainivorous birds. Areas that are heavily infested with Buffel Grass often become 'biological deserts' where few native fauna can survive. Buffel Grass can be poisoned; however seeds remain viable for many years and can germinate quickly after rainfall events, with young plants flowering and setting seed in little more than a week. Thus once established in native plant communities, it can be extremely difficult to eradicate.

A somewhat different situation exists in pastoral areas where Buffel Grass is highly valued as a pasture grass.

Areas currently free of Buffel grass include the floodplain communities in the southern parts of Gurulmundi and other parts of the State Forest where grazing pressure has been minimal.

Many Brigalow communities are already significantly degraded by Buffel grass and Green Panic. As such, there is an opportunity for this project to improve management of these areas to reduce the abundance and biomass of these grasses and thus improve fauna and flora habitat values within these areas.

7.3.5 Noise and Human Activity during Construction

Construction activities involve high levels of human activity and noise. This may disrupt some fauna, particularly if these activities occur near important roosting or breeding sites. Often such sites are used by a particular species because the site has significant microclimatic attributes, freedom from predators and/or proximity to food resources. As such, disturbance to these sites can seriously jeopardise species survival in some instances. The disturbance however, is anticipated to be temporary and thus impacts will be short-term. It will be necessary to include fauna habitat assessments in site clearance procedures to check for nesting birds, important roosts (e.g. Barking Owl, microbat and flying fox daytime roosts) and key habitats such as rock outcrops and cliff faces/gorges.

7.3.6 Increased Levels of Fauna Road Kill

The construction of roads and general increase in human activity in the CSG Field will increase levels of fauna road kill. Road kills are often most frequent at night, in the very early morning and evening when many species are most active. Most human activity along roads will likely occur during the day and unsealed roads are negotiated at low speed, thus road kill impacts are anticipated to be limited, however, monitoring of road kills in areas of high conservation value and response strategies (e.g. reduced speed zones) are recommended in **Section 8**.

7.3.7 Sedimentation, Nutrification and Accidental Release of Saline Water to Watercourses and Wetlands

The potential for the Project to impact on aquatic habitats through sedimentation, nutrification and accidental release of saline water is described in **Section 7.10**.

7.3.8 Potential Beneficial Impacts on Fauna Habitat

The overall condition of much of the CSG Field is relatively poor in terms of fauna habitat, with evidence of frequent and hot fires, environmental weeds and grazing

pressure in many areas. As such, the project may be able to contribute to better environmental outcomes via a number of means. These include:

- The development of a better road network will provide enhanced opportunities for fire control, particularly if prescribed fuel reduction burns are conducted along these roads to widen the fire barrier. The development of fire barriers also provides a safe haven for vehicles and personnel in the event of wildfires. The formulation of a fire management plan will also be important in order to provide for the protection of infrastructure.
- A reduction in fire frequency will allow the regeneration of ground storey vegetation and accumulation of leaf litter. This will supply vital habitats for many fauna species and provide protection from introduced predators.
- **Section 8.8** recommends offset initiatives where impacts to native vegetation and fauna habitats are unavoidable. These areas should be managed with a strong conservation focus and could potentially provide vital protection for flora and fauna in this region where other protected areas (Conservation Parks and National Parks) are absent. Such areas have conservation plans developed for them and active conservation management be undertaken. This would include flora and fauna monitoring to assess the efficacy of conservation practices and to feedback into the development of improved future practices.
- Conservation focussed land management on QGC owned land including development of Conservation Plans and assessment of ecological implications of reducing grazing intensities and/or livestock exclusion.

7.4 Potential Impacts on EVR Fauna

Table 13 lists EVR fauna species that may potentially be impacted by the project and provides an assessment of the potential for significant impacts in accordance with the EPBC Significant Impact Guidelines, Policy Statement 1.1. Based on the fauna field surveys and provided that mitigation mechanisms are put in place the level of impact on EVR species within the CSG Field is projected to be low.

As discussed in **Section 7.4** it is recognised that the project could lead to potential benefits for EVR fauna species.. The mapping of areas of high conservation value (**Section 6.4**) may be used to target key EVR habitats for offset protection.

Table 13 Potential for EVR Fauna Species to be Impacted

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
Insects						
Imperial Hairstreak Butterfly	*Jalmenus evagoras eubulus*	V[2]	Known from mature Brigalow communities, often in association with small hills and ridges.	Moderate	Avoidance of Brigalow communities. Site inspections.	Low
Fish						
Murray Cod	*Maccullochella peelii peelii*	V[1]	May occur in the Condamine River. Current environmental practices ensure that the river and its environs are fully protected.	Low	Condamine River environs excluded from development apart from some necessary easements placed with minimal disturbance	Low
Reptiles						
Five-clawed Worm Skink	*Anomalopus mackayi*	V[1] / E[2]	Poorly known species in the area. Known from roadside grassy verges in disturbed habitats in the Dalby region. Not recorded in field surveys.	Low	Minimal clearing in native grasslands and grassy woodlands where species is likely to occur. Site clearances.	Low
Grassland Earless Dragon	*Tympanocryptus pinguicolla*	E[1]	Restricted to the black soil grasslands found primarily to the east of the CSG Field. Has demonstrated a capacity to adapt to high levels of disturbance in cultivated areas and pastures.	Low	Minimal clearing in native grasslands and grassy woodlands where species is likely to occur. Site clearances.	Low
Brigalow Scaly-foot	*Paradelma orientalis*	V[1 and 2]	The species distribution and habitat preferences are poorly known. It may occur in the northern portion of the CSG Field area. Not recorded in field surveys.	Low	Planning and Pre-clearance Surveys in areas of native vegetation	Low
Dunmall's Snake	*Furina dunmalli*	V[1 and 2]	No baseline data on populations in the area. Normally found in seasonal swampy areas in black soil.	Low	Planning and Clearance Surveys in areas of native vegetation. Primary	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
					habitat excluded from development.	
Yakka Skink	*Egernia rugosa*	V[1 and 2]	Distributed patchily from near Cairns to the Gold Coast. Often in dry sclerophyll forest. Occurrence in the CSG Field unknown. Not recorded in field surveys.	Low	Planning and Clearance Surveys	Low
Golden-tailed Gecko	*Strophurus taenicauda*	R[2]	Woodlands and open forests – Brigalow and Eucalypt associations.	Moderate	Minimal clearing in native vegetation/ high constraints areas. Wildfire prevention during construction.	Low
Birds						
Red Goshawk	*Erythrotriorchis radiatus*	V[1] / E[2]	This species requires extensive areas of intact forest habitat and in such areas, only occurs in low numbers. Not known from the CSG Fields. Records from the Dalby area are unlikely.	Low	Retention of existing large tracts of native vegetation.	Low
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V[2]	Eucalypt forests with Casuarina sp. Modelling has indicated strong correlation with riparian Eucalypt communities.	Low	Minimal clearing in native vegetation/high constraints zone. Wildfire prevention during construction.	Low
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V[1 and 2]	The project area is in the southern part of the species' distributional range. Not recorded during field surveys. It is found in sandy areas adjacent permanent water.	Low	Planning and minimal clearing in forested habitats including riparian areas as per constraints mapping.	Low
White-bellied Sea Eagle	*Haliaeetus leucogaster*	Mi, Ma	In inland areas, this species is associated with extensive bodies of permanent water, none of which exist	Low	Protection of riparian areas, swamps and marshes, including the	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
			in the CSG Field. A possible vagrant along the Condamine River.		immediate environs of the Condamine River. Primary habitat excluded from development.	
White-throated Needletail	*Hirundapus caudacutus*	Mi	A seasonal vagrant that forages well above the tree canopy in the CSG Field areas. Not known to roost or breed in Australia.	Low	Planning and minimal clearing in forested habitats including riparian areas.	Low
Rainbow Bee-eater	*Merops ornatus*	Mi	Seasonal visitor to the CSG Field area and possibly breeds in sandy creek banks and riparian dunes.	Low	Protection of riparian habitats.	Low
Rufous Fantail	*Rhipidura rufifrons*	Mi	Common species in more densely vegetated habitats. Broad distribution.	Low	Planning and minimal clearing in vine forest and forest habitats.	Low
Great Egret	*Ardea alba*	Mi, Ma	Widespread species over much of the continent. No breeding records exist from the CSG Field area and it may possibly use ephemeral pondages and marshes in the area including the environs of the Condamine River.	Low	Protection of riparian habitats.	Low
Cattle Egret	*Ardea ibis*	Mi, Ma	Widespread and recorded from grasslands in the CSG Field although not known to breed there. Often feeds in association with domestic stock.	Low	Planning and minimal clearance of vegetation.	Low
Lathams Snipe	*Gallinago hardwickii*	Mi, Ma	Winter visitor to southern Australia where it is not known to breed. Commonly found in wetlands and adjacent grasslands.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Australian Cotton Pygmy-goose	*Nettapus coromandelianus albipennis*	Mi	Found in coastal central Queensland. The CSG Field are in the extreme south west of the species distributional	Low	Protection of riparian areas, swamps and marshes, including the	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
			range. Often found on water bodies with floating vegetation.		immediate environs of the Condamine River.	
Painted Snipe	*Rostratula benghalensis*	Mi / V[2]	Possibly a visitor to the CSG Field area in winter. Found in wetland areas.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Fork-tailed Swift	*Apus pacificus*	Mi, Ma	Summer migrant to Australia. Aerial forager and not strongly associated with any specific habitat type in the CSG Field.	Low	Planning and minimal clearance of vegetation.	Low
Magpie Goose	*Anseranus semipalmata*	Ma	A northern Australian species with very occasional representation as far south as Brisbane. Not recorded from the CSG Field area but likely to be a vagrant in wetland areas	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Freckled Duck	*Stictonetta naevosa*	R[2]	Nomadic and rare in south-eastern Australia. Well vegetated aquatic environments.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Swift Parrot	*Lathamus discolour*	EN[1]	Impact restricted to feeding habitat, and this would be exceedingly minor, due to the very small percentage of native woodland or forest that might be altered.	Low	Minimal clearance of woodlands and forest areas where possible.	Low
Star Finch	*Neochima ruficauda ruficauda*	EN[1]	Since 1900, few records have come from south of Townsville. If present in the area, it is most likely to be found in Eucalypt riparian areas along rivers.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Regent	*Anthochaera*	EN[1], Mi	As for Swift Parrot. Not recorded from	Low	Minimal clearing in	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
Honeyeater	*Phrygia*		the CSG Field areas. In 2008, breeding was recorded in Durakai SF near Warwick.		forested habitats including riparian areas	
Paradise Parrot	*Psephotus pulcherrimus*	EX[1 and 2]	No records. No longer considered to occur in the area.	Nil	N/A	Nil
Australian Painted Snipe	*Rostratula australis*	V[1]	Widespread in eastern Australia. Not recorded in the CSG Field although it may occur in seasonal wetlands.	Moderate	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Plains-wanderer	*Pedionomus torquatus*	V[1 and 2]	Not recorded in the area.	Nil	N/A	Nil
Black-breasted Button-quail	*Turnix melanogaster*	V[1 and 2]	Dry vine forest is a primary habitat for this species and is exceedingly scarce in CSG Field.	Low	Planning and clearance surveys	Low
Mammals						
Eastern Long-eared Bat	*Nyctophilus timoriensis*	V[1 and 2]	Most commonly found in central western NSW and recorded in Qld in the Inglewood area. Occurs sparsely in a wide variety of habitats.	Moderate	Minimal clearing in forested habitats including riparian areas	Low
Large-eared Pied Bat	*Chalinolobus dwyeri*	V[1] / R	Widely distributed but uncommon species known from mines and caves but is also a tree dweller. Major populations occur in proximity to sandstone and other rocky formations which presumably, are important roosts. Unlikely to occur in significant numbers in the CSG Field.	Low	Planning and minimal clearing in forested habitats including riparian areas	Low
Little Pied Bat	*Chalinolobus picatus*	R[2]	Patchily distributed in woodlands and forests across arid south west and central north Queensland.	Low	Planning and minimal clearing in forested habitats including riparian areas – high constraints	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
					zone.	

***Status:** [1]: Commonwealth (EPBC) listed: **EX** = Extinct; **CE** = Critically Endangered; **E** = Endangered; **V** = Vulnerable; **Mi** = Migratory Species, **Ma** = Marine Species.

[2]: State (NC Act) listed: **EX** = Presumed Extinct; **E** = Endangered; **V** = Vulnerable; **R** = Rare.

7.4.1 Potential Impacts on Migratory and Marine Fauna Species

Desktop studies identified 12 EPBC Act listed Migratory and Marine fauna species that may potentially occur within and in the broad vicinity of the CSG Field (**Table 6**). Of these, field surveys recorded the presence the White-throated Needletail and the Fork-Tailed Swift within the CSG Field. Magpie Geese were seen in Lake Broadwater Conservation Park and Resources Reserve located 30 km outside the southern boundary of the CSG Field.

In regards to these marine and migratory species, an assessment was made as to whether the Project was likely to:

- Lead to loss or modification of habitat important for migratory species (including fragmentation, altered land use, fire regimes, altered nutrient cycle, altered hydrological cycles etc)
- Introduce or establish invasive species, and
- Disrupt species lifecycle (breeding, feeding, migration, roosting etc).

Of the Migratory and Marine species identified, 6 (geese,) are closely associated with lagoons, swamps and other habitats with extensive areas of water, none of which occur in the CSG Field. Three others (Bee-eater, Rufous Fantail and Cattle Egret) are common and widespread throughout the area and have a wide habitat range across many parts of Australia. Two others (swifts) are found in the air space above the CSG Field but are not known to land or breed in Australia. Therefore, as the primary habitat areas of these marine and migratory species will either be excluded from or minimally affected by the proposed developments, potential impacts on these species is projected to be negligible.

7.4.2 Potential Impacts on Regionally Significant Fauna

Regionally significant fauna encompasse a broad range of species, groups and life forms, and therefore, to some extent will be potentially impacted by the factors listed in **Section 7.3** above. However, through field surveys and EPA mapping key habitats of these species has been identified and incorporated in mapping of Environmentally Sensitive Areas (**Section 6.4**). Through use of this contraints mapping these habitat areas will generally be avoided in the development proposal or alternatively have made them subject to stringent operational guidelines (**Section 8**). Thus potential impacts on these taxa are considered to be minimal.

As with EVR species, these habitats may be specifically targeted in any offsets initiative that is adopted in the course of the QGC Field development.

7.4.3 Potential Impacts on Least Concern Fauna

These species will also be potentially impacted by the project although, as with regionally significant fauna, key habitats have been identified and development guidelines have been developed to minimise these impacts.

7.4.4 Potential Impacts on Aquatic Fauna

Aquatic environments in the CSG Field are small in extent and will generally be excluded from development. In some instances, linear features such as small creeks may need to be crossed in order to connect adjacent infrastructure. In these cases, it is expected that implementation of the mitigation measures

described in **Section 8** will substantially control the potential impacts associated with these construction activities.

As with other taxa groups, if an offsets recommendation is adopted, then aquatic habitats may benefit by extra protection through this process.

7.5 Potential Impacts on Wetlands

The internationally recognised wetland downstream of the CSG Field (via the Condamine River) is the Ramsar-listed Narran Lake Nature Reserve. As it is approximately 450 km southwest of the CSG Field, it is considered that there is a low potential that the proposed activities will impact upon this wetland.

No major wetlands occur within the CSG Field. Two occur immediately outside the CSG Field, Lake Broadwater Conservation Park and Resources Reserve and the Gums Lagoon. Lake Broadwater Conservation Park and Resources Reserve is downstream of Broadwater gully that is situated within the CSG Field (ATP648). Consequently without appropriate mitigation measures, there would be potential for some impacts by nutrient and sediment flows and accidental releases of Associated Water. Gums Lagoon is not downstream of the CSG Field therefore this wetland is not expected to be directly or indirectly impacted by the proposed developments.

If QGC acitivites are located in close proximity to ephemeral wetlands, these areas could potentially be impacted by sedimentation, nutrification and accidental release of Associated Water (**Figure 9**). However, no significant direct or indirect impacts to wetlands are considered likely provided that the recommended mitigation measures outlined in **Section 8.0** are employed. That is to say that areas mapped as ephemeral wetlands (RE 11.3.27) are excluded from development.

7.6 Potential Impacts on DERM Essential Habitat Areas

Potential impacts on all EVR flora and fauna species and their preferred habitats are discussed in **Sections 7.2.8** and **7.4**.

Provided that mitigation measures set out in **Section 8.1** are implemented it is considered that there is a low potential for the proposed CSG activities to significantly impact the environmental values associated with any Essential Habitat areas.

7.7 Potential Impacts on Environmentally Sensitive Areas

Environmentally Sensitive Areas are described in **Section 6.4** and shown in **Figure 14**

The previous discussions on potential impacts to flora and fauna values (**Sections 7.1 - 7.9**) apply equally to the Environmentally Sensitive Areas. To avoid repetition, these potential impacts are not repeated here.

In summary, in the absence of appropriate mitigation measures, there would be potential for Environmentally Sensitive Areas within the CSG Field to be significantly impacted by the proposed developments. In order to mitigate these impacts **Section 8** recommends a constraints based approach to development

within the CSG Field which includes identification of constraints areas through the analysis and mapping of overall conservation values. This approach then facilitates the development of a zoning system so that more stringent environmental conditions can be applied to areas of high conservation value. Through the use of this zoning system it is anticipated that potential impacts to key habitats and taxa will be minimal.

Assuming the successful adoption and implementation of the mitigation and rehabilitation recommendations outlined in **Section 8**, the potential for the Project to have significant impacts on Environmentally Sensitive Areas is low. Additionally, there is potential for the project to contribute to protecting and improving environmental values in these areas through conservation focussed offsets and land management initiatives.

8.0 MITIGATION AND REHABILITATION RECOMMENDATIONS

8.1 Approvals Required in Relation to Flora and Fauna

In addition to the receipt of the Environmental Authority for the proposed CSG activities, the Project will require a number of additional approvals in relation to flora and fauna. These may include (depending on the conditions provided with the Environmental Approval):

- Agreement from DEWHA in relation to any unavoidable disturbance of EPBC Act listed flora (e.g. *Philotheca sporadica*)
- A permit from EPA in relation to any unavoidable disturbance of NC Act listed EVR flora (e.g. *Philotheca sporadica*)
- Information about the proposed disturbance of EVR plants (e.g. numbers of individuals unable to be avoided, estimates of numbers remaining in the local and regional contexts and offset activities) would be required to be provided as part of these permit applications
- A Scientific Purposes Permit from EPA in relation to the establishment of permanent monitoring plots within State Forest areas and any non-protected areas acquired through an offsets program
- Ethics Approval from DPI & F in relation to fauna monitoring programs
- Accreditation and spotters permits from EPA for fauna handlers who may have to supervise trench construction activities, and
- Government endorsement of proposed offsets strategy and initiatives.

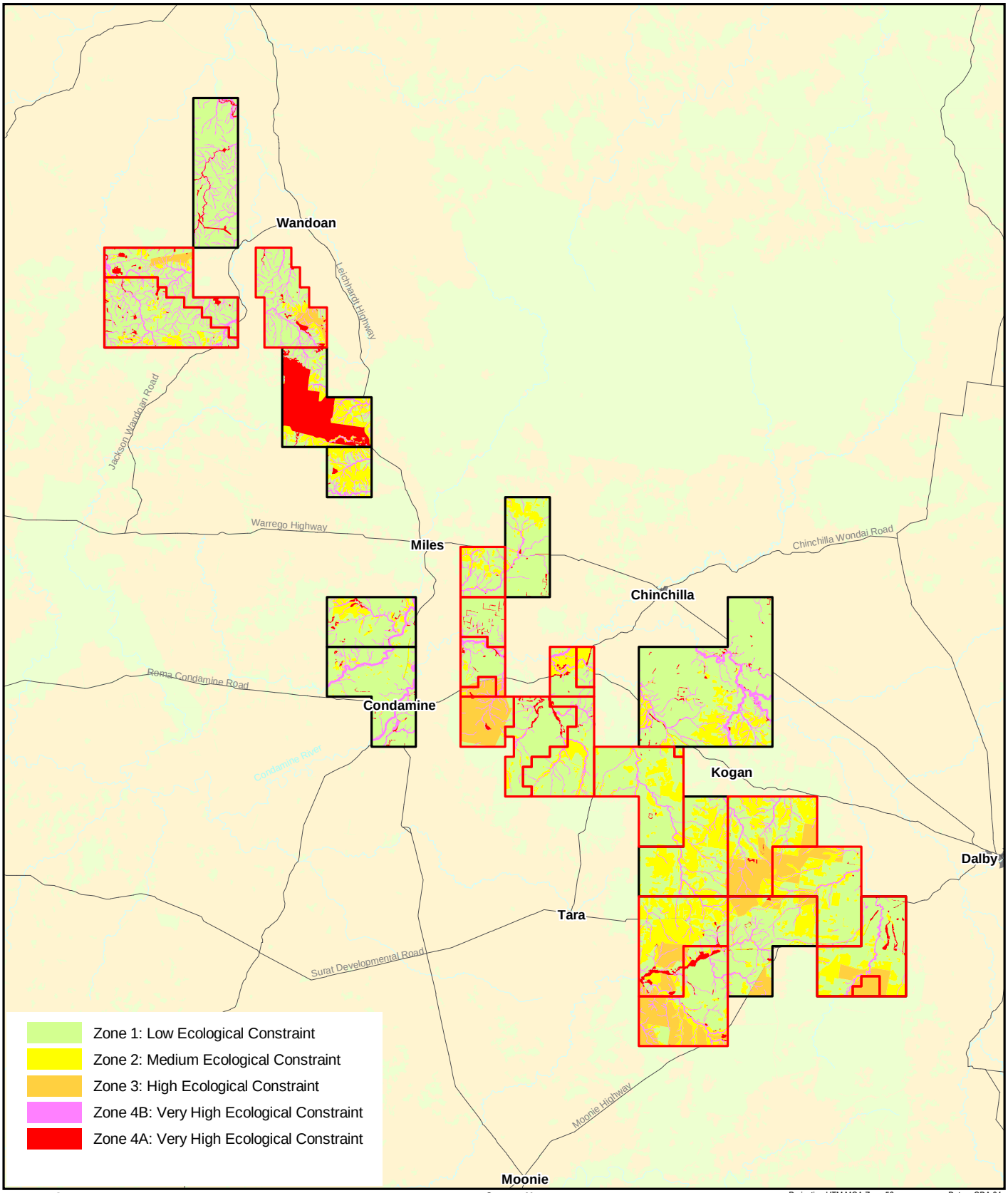
8.2 Constraints Based Approach to Managing Impacts

The synthesis of all conservation values identified from EPA data, specific field survey work and other sources as identified previously in this report, has enabled the development of mapping that indicates the overall conservation values for areas across the QGC Field. This mapping is presented as the Environmentally Sensitive Areas shown in **Figure 14**. The rationale for this mapping is described in more detail in **Section 5.3** above.

This Environmentally Sensitive Areas mapping has then been used as a basis to develop Ecological Constraints mapping which allows for more stringent environmental conditions to be applied in areas of high conservation value and less stringent conditions where conservation values are lower (**Figure 15**).

The mapping is primarily based on RE polygons and tenure considerations. In order to translate this into workable constraints zones for field operations, the mapping has been simplified and four constraints zones have been recommended. They are:

- Zone 1 Minimal Ecological Constraints
- Zone 2 Medium Ecological Constraints
- Zone 3 High Ecological Constraints, and
- Zone 4a and 4b Very High Ecological Constraints.



Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

Regional Ecosystems v5.0 copyright QLD Herbarium
QLD Protected Areas copyright Environment Protection Agency
DCDB data copyright State of Queensland (2008)

Projection UTM MGA Zone 56 Datum GDA 94

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QUEENSLAND CURTIS LNG
A BG Group business

Project: Queensland Curtis LNG Project
Client: QGC - A BG Group business

Title: **Gas Fields - Ecological Constraints Zones**

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Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	**Figure: 15**	
Approved	CDiP	File No:	QC02-T-MA-00109
Date	22.06.09	Revision	A

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The guidelines below are presented as:

1. General recommendations that are applicable across the whole of the QGC Field, and
2. Special recommendations for each constraints zone.

In this way, it is anticipated that potential impacts to key habitats and taxa will be minimised.

8.3 General Recommendations

In addition to the protection measures which are already part of the existing Environmental Management Plan (e.g. weed washdowns, water disposal, audits) (**Attachment 3**), the following mitigation measures are recommended to help ensure that significant impacts on biodiversity are avoided where possible and otherwise minimised:

- Infrastructure should be located away from remnant vegetation areas whenever possible. This includes roadside verges, travelling stock routes and similar areas that may have so far escaped clearing in otherwise cleared and developed areas
- The clearing or disturbance of all EPBC listed Ecological Communities and Endangered and Of Concern REs (with these REs as either dominant or sub-dominant components) are to be avoided whenever possible
- An offset strategy should be developed and implemented which compensates for all unavoidable clearing (refer **Section 8.8**)
- Prior to the commencement of construction, all mapped Essential Habitat areas will be subject to preclearance surveys
- All unavoidable clearing of these areas will be addressed through the establishment of environmental offsets as discussed in **Section 8.8**
- In addition to their current requirements pre-clearance surveys should be expanded to:
    - Note the presence or absence of EPBC Listed communities (including the Weeping Myall Open Woodland Community) and species
    - Identify potential microhabitat for fauna (e.g. hollow-bearing trees) and fauna habitat, which is such that fauna handlers are required to be present at clearing should be identified
    - Record of the results of the EVR flora field clearance searches and fauna microhabitat features
    - Utilise pre-clearance survey forms which identify compulsory answers/options and provide a clear action path stemming from each answer
    - Identify permitting requirements, and
    - Note the presence or absence of declared weed species in order to develop site-specific weed management options (control, vehicle and machinery washdowns).

- A clearing database should be maintained to record the areas of each RE cleared for CSG activities/infrastructure
- Good weed hygiene practices should be adopted to minimise the introduction or spread of declared, agricultural and environmental weeds in the CSG Field. These should include regular ongoing monitoring of areas disturbed by CSG activities
- Declared, agricultural and environmental weeds should be controlled throughout the construction, operational and decommissioning phases of the project. In relation to the construction footprint and areas of disturbance, it is recommended that environmental weeds, such as Buffel Grass (*Cenchrus ciliaris*), Castor Oil (*Ricinus communis*), Mexican Poppy (*Argemone ochroleuca*), Mimosa Bush (*Acacia farnesiana*) and Guinea Grass/Green Panic (*Megathyrsus maximus*) are also managed, particularly during the construction phase and subsequent rehabilitation works. Rehabilitation of disturbed areas may also benefit from control of other exotic grasses; however, landholders may request that these species are retained for grazing purposes
- A Weed Management Plan that addresses the construction, rehabilitation and operation phases of the project should be prepared prior to construction. This Plan should include hygiene protocols to minimise the likelihood of introduction and spread of environmental, agricultural and declared weeds
- Fauna handlers should be present to survey for, and as necessary relocate wildlife immediately prior to and during clearing activities in all locations identified as containing suitable fauna habitat during the pre-clearance surveys
- Monitoring of road kills in areas of high conservation value and development of response strategies (e.g. reduced speed zones)
- Fire fuel loads should be monitored and vehicle activities should be restricted to roads, access tracks and hardened surfaces to reduce the possibility of wildfire. Vehicles should be fitted with spark arrestors and fire fighting equipment should be available at construction sites
- A fire management plan should be developed and implemented in order to provide for the protection of infrastructure
- Vegetated creeklines, fencelines and road reserves should be crossed at approximately 90 degrees whenever possible to limit the extent of clearing
- Measures should be taken to avoid placing water storage facilities in the Lake Broadwater catchment area (Broadwater Gully) which occurs in the south eastern corner of ATP648. This may help reduce the potential for nutrient, sediment and Associated Water (accidently released) flows entering Lake Broadwater Conservation Park
- The EMP should include appropriate requirements in relation to management of waste and potential contaminants, and
- Conservation Plans should be developed and implemented. These plans should set out conservation focussed land management initiatives to be taken on QGC owned land.

8.4 Recommendations for Zone 1 Minimal Ecological Constraints

These areas are substantially altered habitats with existing pastures of predominantly non-native species, cropping lands, intensively grazed and rural-residential areas. Some unmapped remnant vegetation may occur along the margins of paddocks or in roadside reserves and may be of moderate to high conservation value but are relatively small in extent and managed in the overall context of the predominant land use of the area.

Since the majority of this zone is privately owned and managed for primary production, the wishes of the landholder will be a primary factor in determining the placement and management of infrastructure, subject to the general guidelines above (**Section. 8.3**) as they relate to least concern flora and fauna, EVR species, Ecological Communities / REs and weeds.

Final rehabilitation requirements for sites in this zone will be negotiated with the landowner. In most cases they would provide for the return of areas to productive agricultural land.

8.5 Recommendations for Zone 2 Medium Ecological Constraints

Zone 2 Areas include all mapped remnant vegetation (with the exception of Zone 3 and 4 areas). In addition to the General Guidelines, the following mitigation measures are recommended for Zone 2 Areas:

- Infrastructure and access lines should be located along existing easements where possible
- Individual site pre-clearance surveys should be undertaken for each proposed road, bore pad and pipeline (and other infrastructure), as is currently the practice, to enable detection and avoidance of flora and fauna values whenever possible. In addition to their current requirements pre-clearance surveys should be expanded to:
    - Note the presence or absence of EPBC Listed communities (including the Weeping Myall Open Woodland Community) and species
    - Identify potential microhabitat for fauna (e.g. hollow-bearing trees) and fauna habitat, which is such that fauna handlers are required to be present at clearing should be identified
    - Record of the results of the EVR flora field clearance searches and fauna microhabitat features
    - Utilise pre-clearance survey forms which identify compulsory answers/options and provide a clear action path stemming from each answer
    - Identify permitting requirements, and
    - Note the presence or absence of declared weed species in order to develop site-specific weed management options (control, vehicle and machinery washdowns).
- Fauna handlers should be present to survey for, and as necessary relocate wildlife immediately prior to and during clearing activities in all locations identified as containing suitable fauna habitat during the pre-clearance surveys

- Vegetative waste as a result of clearing should be mulched or distributed across adjacent areas where it may provide refuge for terrestrial species. It should not be burnt, and
- Linear features such as roads and pipelines should be built to a standard sufficient to allow for their intended purpose but should be allowed to revegetate as much as possible so as to minimise their impact on terrestrial fauna movements.

8.5.1 Rehabilitation Requirements

Rehabilitation should be negotiated with the landholder where applicable. Unless roads and pads are to be retained for other use, areas should be ripped and allowed to naturally revegetate. Hardened road surfaces should be removed or regraded to restore the original land surface as much as possible.

A re-seeding plan should be developed based on soil types, existing local vegetation characteristics and landholder preferences along the alignment.

If available (and subject to landholder preferences), local provenance native seed should be used for regeneration seeding following construction in all disturbed areas. If local provenance seed cannot be collected or purchased, native grass seed from other parts of central Queensland should be purchased from commercial operators and re-spread in these locations.

Monitoring and control of weeds should be conducted on an ongoing basis during the life of the Project. A Weed Management Plan that addresses the construction, rehabilitation and operation phases of the project should be prepared prior to construction. This Plan should include hygiene protocols to minimise the likelihood of introduction and spread of environmental, agricultural and declared weeds.

Stickrake piles, respreading or mulching of vegetative wastes is recommended. Burning of vegetative wastes should be avoided. Rehabilitation should be monitored on a monthly basis for six months after works are completed and then bi-annually for two years.

8.6 Recommendations for Zone 3 High Ecological Constraints

Zone 3 areas are all the State Forests within the CSG Field, with the exception of Gurulmundi State Forest, namely:

- Hinchley State Forest
- Mount Organ State Forest
- Cherwondah State Forest
- Condamine State Forest
- Braemer State Forest
- Vickery State Forest
- Daandine State Forest
- Weranga State Forest, and
- Kumbarilla State Forest.

State Forests were selected as High Ecological Constraints areas because they contain a vast majority of the mapped REs of high conservation value. This is in addition to areas of significant value to EVR flora and fauna, refugial areas and areas critically important to the maintenance of existing biodiversity values.

For High Constraints areas, the following recommendations are made in addition to those identified in **Sections 8.3-8.5**:

- All CSG Activities to be planned and undertaken in close liaison with EPA State Forest Management staff
- Where possible, site access to be only along existing cleared tracks, fire trails and easements. Where this is not possible, access is to be negotiated with EPA State Forest management staff
- EPA and/or independent flora and fauna consultants to be involved in detailed pre-clearance surveys as part of early planning for infrastructure locations
- In order to minimise fragmentation effects pads for gas extraction will be of minimum safe area and placed against the edge of existing easements where possible
- Extraction methodologies that minimise the density of well pads in these areas (e.g. horizontal drilling) be investigated and used where practicable
- Vehicles and machinery will require washdown before entering State Forest, if they have come from Zone 1 areas or known weed areas. The control of Buffel grass is a key consideration in this zone, and
- Access tracks will be regularly inspected for weeds and control measures employed where serious environmental or declared weeds are identified. It is recognised that some weed species may have established in areas pre-project commencement, and so less emphasis will be placed on these. The primary object of the guideline is to control weed spread that may occur as a direct result of the project.

8.6.1 Rehabilitation Requirements

Rehabilitation will be managed in close liaison with the landholder (EPA) and involve the restoration of sites to a level that is mutually acceptable to the parties, the overall goal being the maintenance of biological processes and conservation of natural systems.

8.7 Recommendations for Zone 4a and 4b Very High Ecological Constraints

Zone 4a and 4b included areas with the highest ecological values. These values could potentially be significantly impacted by the CSG activities. It is therefore recommended that all non-linear CSG infrastructure be excluded from these Zones.

Zone 4a areas are considered to have higher conservation values than Zone 4b. They are distinguished from each other only for the purpose of enabling planning of linear infrastructure to avoid Zone 4a areas in preference to Zone 4b areas in locations where such areas are unavoidable.

Areas within Zone 4a include:

- Gurulmundi State Forest and the Environmentally Sensitive area immediately north west of the State Forest (the location of linear infrastructure (e.g. pipelines and access tracks) through this area should be determined by ecologist field studies at the detailed design stage. This infrastructure should follow existing tracks and previously disturbed areas where possible and to avoid or minimise disturbance of highest value areas (e.g. EVR plant populations, high quality fauna habitats, steep terrain). QGC will not undertake drilling or development of non-linear infrastructure in this area prior to government endorsement of detailed development plans showing proposed production techniques and infrastructure locations. Such a plan would be based on detailed ecological investigations within this area and would aim at ensuring that any such development would be undertaken in an ecologically sustainable and acceptable manner.
- EPBC Act listed Ecological Communities, and
- The EPA defined Category B Environmentally Sensitive Areas which, in the CSG Field, include:
  - VM Act Endangered Res, and
  - Additional REs classified as Endangered under the EPA's Biodiversity Status.

Areas within Zone 4b include:

- RE 11.3.27 (ephemeral wetlands), and
- Buffer zones adjacent to watercourses in accordance with the Environmental Authority conditions for QGC's existing operations, namely:
  - 50m from Stream Order 1 and 2 watercourses
  - 100m from Stream Order 3 and 4 watercourses, and
  - 200m from Stream Order 5-8 watercourses.

It is recognised that in a small number of instances linear infrastructure (e.g. collection lines, pipelines and access tracks) will be unable to avoid transecting linear remnants and watercourses of very high ecological value (i.e. Zone 4 a and b areas). Provided such unavoidable impacts are minimised and compensated for by offset initiatives the proposed activities will not have a significant impact on the conservation values of these areas.

8.8 Environmental Offsets and Conservation Focused Land Management

An environmental offsets strategy should be developed prior to the commencement of the Project. That strategy will identify the environmental offset activities which will be established to compensate for all ecological impacts (e.g. loss of vegetation, fragmentation of fauna habitat and movement corridors, disturbance of EVR flora) where clearing and CSG extraction activities within areas of remnant vegetation areas are unavoidable. It is envisaged that there will be opportunities to undertake most offset activities within the Gas Field (as opposed to removed locations).

To the greatest practicable extent the offset activities will address both Commonwealth and Queensland Governments' offsets legislation and policy, including Part 9 of the EPBC Act (in particular s. 134 and 136), and the

Queensland Government's Environmental Offsets Policy (QGEOP) (EPA 2008). As such, the offset activities will incorporate the following principles:

- Offsets should only be utilised in situations where impacts on environmental values are unavoidable
- The offset must directly relate to the environmental value that will be impacted, often referred to as the "like for like" principle
- The offset may be either direct or indirect actions. A direct action usually requires the on-ground maintenance and/or improvement of the protected matter. An indirect action, however, includes a wide range of actions that improve the knowledge and understanding of a protected matter in order to facilitate its conservation
- The implementation of the offset must be timed to minimise the time lag between the impact and the delivery of the offset
- Where possible the offset will be located in the vicinity of the impact
- The offset must be legally secured, and
- Mechanisms will be put in place to ensure that the offset is enforceable, monitored and audited.

According to the QGEOP, an environmental offset is taken to be legally secured if protected by some form of legally binding mechanism. These can include:

- Designation as a protected area under the *Nature Conservation Act*
- Designation as an area of high nature conservation value under the *Vegetation Management Act*, and
- The purchase of land or the establishment of a covenant under the Land Title Act 1994 (EPA 2008d).

It is preferable that offsets are protected for the long term by purchasing land or establishing covenants on title (e.g. VM Act covenants). As such, selection of offset sites will also depend on a number of non-environmental factors including:

- land tenure – tenure needs to enable purchase or covenants on title
- landholder preferences – it will be necessary to find willing landholders to sell or covenant land, and
- land use – (e.g. alienation of GQAL constraints and possible synergies and constraints relating to CSG activities and other land uses).

It is recommended that the QC LNG Offset Strategy sets out a process to identify landholders within offset priority areas. In the first instance, sites should be identified on the basis of their conservation values and similarity to those areas likely to be impacted ("like for like").

Current government policy stipulates that a 'package' of offset actions is likely to lead to the better conservation outcomes. QC LNG should be in keeping with this best practice by considering a broad range of direct and indirect actions throughout the initial development stage of its Offsets Strategy.

Priority offset areas from an environmental perspective would include:

- Matters of National Environmental Significance
- Endangered REs
- Of Concern REs
- Any REs where clearing may be considered as a significant impact
- Particular EVR fauna habitats
- EVR flora rich areas
- Connections/Corridors
- Riparian areas
- Areas containing wetlands and Marine Plant areas (REs 11.1.2, 11.1.4, 11.3.27), and
- Areas linking/adjoining any of the above areas.

Flora assessments and detailed fauna surveys have noted the relatively degraded state of many environments in the Gas Field. The impacts identified include inappropriate fire regimes, environmental and declared weed invasions, feral animals and grazing pressure from stock.

Through its investment in the region, QGC will provide opportunities to manage some of these environmental issues and thus realise local environmental benefits. QGC has invested significantly in fencing and gates to control stock movements, improved access tracks and increased personnel in the region, all of which assists in fire prevention and limits weed propagation. Areas dedicated as environmental offsets, would provide further opportunities for enhanced environmental management through the dedication of special purpose conservation areas and may improve the connectivity between these environments.

It is recommended that where offset areas are established, management and monitoring plans be developed in order to guide the strategic development of these areas, identifying key values, threats and the environmental management strategies required to achieve the appropriate conservation outcomes.

The environmental management of these areas should generally encompass:

- Fire management planning and activities (e.g. firebreak grading, fire mapping, fire response planning)
- Livestock exclusion (e.g. fencing)
- Weed control
- Feral animal control activities (e.g. fox and rabbit baiting), and
- Flora and fauna monitoring in order to assess implemented management strategies.

9.0 CONCLUSION

Provided that the recommended mitigation and rehabilitation measures identified in this report are adopted and successfully implemented, the proposed CSG extraction activities will be unlikely to have a significant impact on any of the biological features and values described .

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ATTACHMENT 1 – STAND ALONE REPORT ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

ANNEX 13.1 – CSG FIELD

STAND ALONE REPORT ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Doc. No. QC LNG-00-N-RP02

1	Final	BT/SM	SF	SF	11 Jun 09
0	Issued for QGC Review	BT/SM	SF	SF	20 Mar 09
A	Issued for Internal Review	BT/SM	SF	SF	14 Mar 09
Rev	**Description**	**Originator**	**Reviewed**	**Approved**	**Date**

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1.0 PURPOSE

This Annex considers the CSG Field Component of the Queensland Curtis LNG Project. An overview of the CSG Field Component is provided in **Volume 1, Chapter 7** of the EIS.

All EPBC Act MNES in the Coal Seam Gas (CSG) Field are flora or fauna related and this report provides specialist flora and fauna assessments of the CSG Field shown in **Figure A.1 [QC02-T-MA-0031]**. The CSG Field is located within the Surat Basin, a resource region in southern Queensland. The tenures are within the Dalby Regional Council and in the vicinity of Miles, Chinchilla, Condamine and Tara townships. The Condamine River bisects the tenure areas which are predominantly rural and used for grazing and dry land cropping. Rural residential blocks occur through central portions of the CSG Field, particularly in the vicinity of Tara.

The area is 468,700 ha and is located in the Surat Basin. The CSG Field extend from near Wandoan in the north to south-east of Tara in the south.

The flora and fauna studies considered publically available databases and published information on the project area as well as detailed field surveys undertaken throughout the CSG Field.

This report details the existing nature conservation values of the CSG Field in terms of:

- Integrity of ecological processes, including habitats of species and communities listed under the EPBC Act
- Biological diversity, including habitats of rare and threatened species
- Integrity of landscapes and places including any natural places, and
- Aquatic and terrestrial ecosystems.

This report examines the potential and known occurrences of protected plants, animals and communities as identified under the EPBC Act.

The report discusses the nature conservation values of the areas likely to be affected by the Project and identifies mitigation measures to assist in avoiding or minimising impacts on Environmentally Sensitive Areas, areas of remnant vegetation and other areas of conservation value. Where avoidance is not possible, recommendations are made in relation to appropriate offset activities.

2.0 BACKGROUND

2.1 Existing Environmental Authority Conditions

Thirteen Petroleum Leases (PL) (including current applications) and four pipeline licences are held within the CSG Field acreage. These tenures are subject to one Project Environmental Authority under the *Environmental Protection Act 1994* (Qld) for activities in the Walloon Fairway area (excluding PL 201and PLA 180).

The environmental protection conditions stipulated in the EA that relate to vegetation management, riverine areas and Environmentally Sensitive Areas are shown in **Attachment 2** of **Appendix 3.2**. They include:

- Minimise disturbance to vegetation
- Minimising disturbances near riverine areas, watercourses and water bodies
- Minimise disturbance in or near category A or B Environmentally Sensitive Areas (ESAs)
- Not conducting any activities within category C ESAs without approval from the relevant administering authority
- Where no reasonable alternative exists, disturbance within (or within 500 m of) an endangered regional ecosystem must be located according to the following order of preference:
  a. Pre-existing disturbance areas within the 500 m buffer of the ESA
  b. >100 m from the ESA
  c. <100 m but outside the ESA
  d. Pre-existing disturbance areas within the ESA
  e. Areas within the ESA of lower environmental value
  f. Within the ESA but not to exceed 10 % of a polygon mapped as an endangered regional ecosystem (and all reasonable effort is made to minimise the area cleared and to avoid clearing mature trees).
- This unavoidable clearing within an endangered regional ecosystem (or within 500 m cannot be:
  g. >10 % of a polygon mapped as an endangered regional ecosystem
  h. >3,600 m^2 for the operational area of a drill site within an endangered regional ecosystem
  i. >30 m^2 for construction of a sump within an endangered regional ecosystem
  j. >6 m in width for tracks that are necessary within an endangered regional ecosystem
  k. >12 m in width for pipeline construction purposes that are necessary within an endangered regional ecosystem.

2.2 Existing QGC Environmental Clearance Procedures

The existing QGC field development activities are undertaken in accordance with the Level 1 EA for the petroleum activities on its CSG Field. The standardisation of environmental management across the CSG Field has progressed under a project Environmental Management Plan which details the potential impacts, environmental protection objectives and environmental mitigation measures/controls for petroleum activities to be undertaken (**Attachment 3** of **Appendix 3.2**). This has been prepared in consultation with the EPA to meet their regulatory requirements.

There are effectively two stages at which QGC currently ensures that future infrastructure locations avoid or minimises disturbance of EPBC listed communities). These are:

- macro-scale avoidance, where planning avoids known areas of EPBC Act Listed Ecological Communities through desktop reference to existing government Regional Ecosystem (RE) mapping, and
- micro-scale avoidance, where the site clearance procedure allows infrastructure to avoid or minimise disturbance of unmapped communities, as well as listed flora species, fauna habitat features and other environmental values and features of significance.

Initial desktop assessments identify the known locations of EPBC Act Listed Ecological Communities and this information is used in the planning phase for locating any infrastructure so as to avoid and minimise disturbance to these communities.

Once a generally desirable location for each proposed well (or other infrastructure) is identified, a significant amount of flexibility remains in relation to its precise location. The current QGC environmental clearance procedure (**Attachment 4** of **Appendix 3.2**) allows the environmental officer to relocate the proposed location by up to 50 m without need for consultation with the geologist. Where the environmental officer identifies a need to relocate a proposed well site by greater than 50 m, this is to be done in consultation with the QGC geologist. An identical and concurrent procedure is used by the cultural heritage monitors and construction engineers. The environmental clearance survey facilitates avoidance of unmapped communities and flora species as well as fauna habitat values and other environmental values and features. An example of a completed environmental clearance checklist is provided in **Attachment 5** of **Appendix 3.2**.

3.0 ASSUMPTIONS AND LIMITATIONS

The northern most tenements shown as EPP768 and PL171 in **Figure A.1 [QC02-T-MA-0031]** were included as part of the CSG Field after the fieldwork was completed. As such, the assessment of these areas was limited to a desktop assessment. Field assessment of these areas will be completed within the next few months and the results will be available for inclusion in the supplementary EIS.

Scale-dependant inaccuracies are found to occur within Queensland Herbarium RE mapping; for example, small remnants along creeks and road reserves may not be detected and small scale variation within larger remnants may not be recognised.

During the flora and fauna assessment, wherever possible at least one occurrence of each RE was visited and ground truthed. However, it was not possible to ground truth every RE occurrence in the CSG Field due to landholder access constraints. As such, the existing Queensland Herbarium RE mapping was used to estimate the areas of each RE type which occur within the CSG Field and the wider study area. Fauna habitat mapping has been derived from the same sources and is subject to similar assumptions and limitations.

Detailed flora and fauna assessments were carried out over as much of the CSG Field as possible, however a significant degree of extrapolation was required when applying these values to the whole of the CSG Field. When compiling the desktop assessment, a species was considered to occur in the area if it was recorded in database searches for the region and based on existing knowledge of the species' ecological requirements, suitable habitat was considered to occur in the area. When analysing field survey results, the extrapolation of fauna values was based upon the assumption that the habitat type in which a species was recorded, was also likely to support that species elsewhere. Both desktop and field surveys may therefore have over-estimated the distributional extent of some species. Thus a precautionary approach has been adopted throughout this assessment and such assumptions are explicitly stated in the relevant discussions.

Whilst parts of the CSG Field are cleared and likely to be suitable for locating some of the project's infrastructure the specific locations for wells, access roads, compressor stations, construction camps and other support infrastructure were not known at the time of the assessment.

Estimated clearing footprints have been calculated using GIS based Queensland Herbarium RE mapping. Areas for individual REs are shown to two decimal points in order to better reflect the extent of the smaller remnant areas (e.g. <1 ha). Total areas are rounded to whole hectares where this rounding has no material affect on comparisons to better reflect the degree of accuracy of the estimations. Where totals have been rounded, they may not equal the sum of the component areas due to rounding errors.

4.0 ASSESSMENT METHODOLOGY

4.1 Assessment of Significance of Impacts

In this report, assessments of potential impacts have been assessed in accordance with the EPBC Significant Impact Guidelines, Policy Statement 1.1. (DEWHA 2006)

In this guideline, DEHWA provides a framework to assist in determining whether the impact of an action on any matter of NES is likely to be significant:

'An action has, will have, or is likely to have a significant impact on an endangered ecological community if it does, will, or is likely to:

- *Lead to a long-term adverse affect on an ecological community;*
- *Reduce the extent of a community;*
- *Fragment an occurrence of the community;*
- *Adversely affect habitat critical to the survival of an ecological community;*
- *Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival;*
- *Result in invasive species that are harmful to the critically endangered or endangered community becoming established in an occurrence of the community; or*
- *Interfere with the recovery of an ecological community.'*

4.2 Flora Assessment

4.2.1 Determination of Significance Level

Threatened Ecological Communities

Threatened Ecological Communities as listed under the EPBC Act can be transposed for the most part, to the descriptions assigned by the Queensland Herbarium's Regional Ecosystem (RE) mapping. Those of relevance to the CSG Field are shown in **Table 1**.

Table 1 Translations from EPBC to VM Act Status for communities in the Brigalow Belt Bioregion.

RE Description	Qld VM Act Designation	EPBC Threatened Ecological Community
11.3.1	Endangered	Brigalow (*Acacia harpophylla* dominant and co-dominant)
11.4.3	Endangered	
11.4.7	Endangered	
11.4.8	Endangered	

11.4.9	Endangered	
11.4.10	Endangered	
11.5.16	Endangered	
11.9.1	Endangered	
11.9.5	Endangered	
11.9.6	Endangered	
11.11.14	Endangered	
11.12.21	Endangered	
11.2.3	Of Concern	Semi-evergreen vine thickets of the Brigalow belt (North and South) and Nandewar Bioregions
11.3.11	Endangered	
11.4.1	Endangered	
11.5.15	Not of Concern	
11.8.3	Not of Concern	
11.8.6	Not of Concern	
11.8.13	Endangered	
11.9.4	Endangered	
11.9.8	Not of Concern	
11.11.18	Not of Concern	
11.3.2 (in part)	Of Concern	Weeping Myall Woodlands
11.3.28 (in part)	Of Concern	

Threatened Species

Threatened species, pursuant to s 179 of the EPBC Act threatened flora species are classified as one of the following status categories:

- Extinct
- Extinct in the wild*

- Critically endangered*
- Endangered*
- Vulnerable*
- Conservation dependent

Note that species classified as Extinct and Conservation dependant are not considered to be matters of National Environmental Significance (NES) (DEWHA 2009).

4.2.2 Flora Desktop Assessment

The flora desktop assessment included:

- Review of Queensland Herbarium HERBRECS data, WildNet database and DEWHA Protected Matters flora data which was initially sourced 10 April 2008 and updated 8 December 2008. The data search area was rectangular, covering an area at least 10 km either side of the CSG Field (equating to the area -25.822778° S to -27.435833°S and 149.460278°E to 151.179722°E)
- Review of Queensland Herbarium RE mapping (Version 5.0, 2005) for a 10 km buffer around the CSG Field to establish those Ecological Communities mapped by the EPA at a scale of 1:100 000
- Examination of satellite imagery to gain an appreciation of the project's proximity to sensitive areas, assess vegetation patterns and identify target areas for field investigations, and
- Review of the EPA Brigalow Belt South Biodiversity Planning Assessments (EPA 2008a), EPA Biodiversity Planning Assessment Brigalow Belt South Flora Expert Panel Report (EPA 2008b) and the Biodiversity Planning Assessment Brigalow Belt South Landscape Expert Panel Reports (EPA 2008c) to identify species and areas that are recognised as State, Regional or Local Biodiversity Significant or are flagged as important for their integrated biodiversity values within close proximity to the project area.

A complete list of the EPBC Act Listed flora species that desk top studies identified as potentially occurring within and in the vicinity of the CSG Field is provided in **Attachment 8** of **Appendix 3.2**.

It is recognised that the information gained from these databases has caveats attached to it regarding the robustness or completeness of the information.

HERBRECS data is based almost exclusively on plant specimens actually recorded as present in the given locations. The absence of any specimen records for a particular species from an area does not imply that that species does not occur in that area.

Data from the DEWHA EPBC Act website is based on a combination of actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics. The mapping of a particular species in a search area does not guarantee that the species actually occurs in that area.

4.2.3 Flora Field Assessment

Field surveys of the CSG Field were conducted between 17 July and 9 September 2008, and the 22 and 23 of January 2009, by Unidel Botanist, Ann Moran (CV provided in **Attachment 6** of **Appendix 3.2**). Representative portions of the CSG Field were traversed by vehicle and / or foot.

The field surveys included:

- Investigation of the presence / absence or likely presence / absence of EPBC Act Listed flora species and communities identified in Commonwealth and State legislation
- Ground truthing of 126 sites through the CSG Field. Of these, 45 sites were detailed Tertiary level assessments and the remainder were assessed to Quaternary level. Quaternary assessments recorded dominant canopy species, while Tertiary assessments recorded an inventory of all woody flora species, their average height and their approximate abundance (including native and exotic flora species). Where possible, at least one Tertiary survey site was located within each RE type present in the CSG Field. Landowner access constraints prohibited surveys within some RE types. Tertiary assessments also included targeted searches for potential EPBC Act Listed and regionally significant flora species. Comprehensive flora species lists and detailed abundance data were not collected or considered necessary for the purposes of this assessment, and
- Observations on the wider environment of the CSG Field so that the potential impacts associated with proposed activities could be considered in the local, regional and State contexts.

The flora site surveys were in accordance with the Queensland Herbarium vegetation survey methods described in Neldner *et.al.* (2005). The following data was collected for the Tertiary sites:

- Confirmation of RE type
- General description of vegetation
- Structural characteristics of vegetation (based on life forms, approximate height and relative dominance)
- Groundcover characteristics
- Vegetation condition (integrity) as either pristine, excellent, very good, good, average, degraded or completely degraded
- Occurrence of weed species
- Dominant species in each structural component of the vegetation;
- Patch size and shape
- Landscape characteristics
- Soil characteristics, and
- Notes on particular sensitivities to the proposed impacts.

Locations of Tertiary and Quaternary sites are shown in **Figures A.2-A.13**.

GPS coordinates were taken using hand held GPS (accuracy +/- 10-20 m) to identify survey site locations and to assist in validating the existing Queensland Herbarium RE mapping. The general distributions of declared and other significant pest plants within the CSG Field were also noted.

4.3 Fauna Assessment

4.3.1 Determination of Significance Level

As was the case for the flora species, pursuant to s 179 of the EPBC Act, threatened fauna species can classified into one of the following categories:

- Extinct
- Extinct in the wild*
- Critically endangered*
- Endangered*
- Vulnerable*, and
- Conservation dependent.

Note that species classified as Extinct and Conservation dependant are not considered to be a matter of National Environmental Significance (NES) (DEWHA 2009a).

Threatened or non-listed Migratory and / or Marine species listed under international conventions or agreements that Commonwealth of Australia has ratified are given additional protection under the EPBC Act. These are:

- Japan - Australia Migratory Bird Agreement (JAMBA)
- China - Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA), and
- Convention on the Conservation of the Migratory Species of Wild Animals (Bonn Convention).

4.3.2 Fauna Desktop Assessment

The desktop study involved a review of published material and searches of relevant databases and archives. This assessment was used to document known records for the study area, identify the potential presence of significant fauna species and assist in targeting areas for field assessment. The desktop components undertaken included:

- Collection and review of existing EPA WildNet data, Birds Australia data, Queensland Museum data and EPBC Protected Matters Search for the area -25.8227° S to -27.435833 S and 149.4602° E to 151.1796° E
- Review of the Brigalow Belt South Biodiversity Planning Assessment (EPA 2008a) to identify areas that are recognised as State, Regional or Local Biodiversity Significant or flagged as important for their integrated biodiversity values that are within close proximity to the project area
- Review of Queensland Herbarium RE mapping for the corridor to establish those vegetation communities mapped by the EPA at a scale of 1:100 000 as well as satellite imagery to gain an appreciation of potential fauna habitats and of the project's proximity to sensitive areas, and

- Search of the Directory of Important Wetlands database.

The following texts were also reviewed: Baker *et al*. (1995), Cogger (2000), Duncan et al. (1999), Ehmann (1992), Garnett and Crowley (2002), Greer (2005), Menkhorst and Knight (2004), Morcombe (2003), Robinson (1998), Strahan (1995), Wilson (2005), Wilson and Swan (2003) and Wilson and Knowles (1988).

4.3.3 Fauna Habitat Mapping

All REs identified as present within the project area were stratified into broad Faunal Habitats, based on the classification of Major Vegetation Groups and Subgroups identified by the National Vegetation Information System (NVIS) framework, developed for the National Land and Water Resources Audit (NLWRA 2001). Information used to categorise REs into Habitats was drawn from the RE descriptions (including landforms) in Sattler and Williams (1999) and in version five of the *Regional Ecosystem Description Database* (EPA 2007), along with data from the *Australian Terrestrial Biodiversity Assessment 2002* (NLWRA 2002).

4.3.4 Fauna Field Assessment

Initial rapid assessments to appraise fauna habitat were conducted in conjunction with the Quaternary flora assessments as described above. As for the flora, these surveys covered a range of landforms, land tenures and vegetation RE classifications.

Detailed fauna surveys were then carried out in the CSG Field from 27 October to 2 November, 12-18 November and 3-9 December 2008. In addition, surveys in other locations within the CSG Field were conducted during the week of the 24-28 October 2008.

The sites chosen for detailed fauna surveys were based on the analysis of the Quaternary assessments with the aim of surveying representative areas of intact native vegetation, since it was assumed that such areas would provide the best indication of fauna abundance and diversity. Similar criteria have been used to identify survey sites elsewhere (Pennay *et al*. 2002). Sites were also selected to minimize disturbance to livestock and property management activities, and also to reduce the likelihood of damage to survey equipment.

Three sites were selected for the detailed fauna survey. These were located in Braemar State Forest, Condamine State Forest and Gurulmundi State Forest near Miles. In addition to the quaternary assessments, rural lands were also further assessed by day surveys from the 24-28 October 2008.

Fauna surveys were conducted using pit fall traps, bat traps, ultrasonic bat recording, remote cameras, observational bird transects and night spotlighting. Details of this trapping/observation effort are summarized in **Table 2** below.

Pit fall traps consisted of pvc tubes of approximately 25 cm in diameter and 45 cm deep. Two pit falls were placed in each sampling site along a plastic fence line 10 to 12 m long.

Ultrasonic bat recording was undertaken using a time expanded recording system from Binary Acoustic Technology (http://binaryacoustictech.com/) and was used as an adjunct to bat trapping with 3 bank harp traps supplied by FaunaTech (PO Box 1655, Bairnsdale, Victoria 3875).

Remote cameras were small Sony S600 digital cameras, activated by PIR sensors. The cameras were set to automatic and recorded fauna 24hrs a day.

Playback of Powerful Owl and Barking Owl calls was used during spotlight surveys in order to enhance detection of these species.

Fauna surveys were carried out under Ethics Approval CA 2008/08/294 and EPA Scientific Purposes Permit WISP05501608.

Table 2: Trapping/observation effort

Trapping/Observational Technique	Number of Traps/Observations per day	Total Trapping/Observational effort
Pit fall traps	16	288 pit fall days
Bat traps	3	63 bat trap nights
Bird transects	4 hrs	280 hrs
Spotlighting	2 hrs	42 hrs
Ultrasonic bat recording	0.5 hr	10.5 hrs
Camera Traps	6	216 trap days*

*Camera traps were set for a period longer than the duration of the main survey period.

4.4 Mapping of Environmentally Sensitive Areas

In order to evaluate the conservation significance of areas in the CSG Field the following data were overlaid using GIS layers:

- BAMM methodology (the GIS product referred to as a Bioregional Planning Assessment)
- EPA's Environmentally Sensitive Areas
- Threatened Species and Ecological Communities (EPBC Act)
- Endangered REs (VM Act) (incorporated within BAMM Methodology)
- Of Concern REs (VM Act)
- Woodlands fringing drainage lines (RE 11.3.25)
- Wetlands (RE 11.3.27).

Numerical values were assigned to the criteria in order to allow the summation of an overall score (**Table 3**). In some cases where several BAMM criteria evaluated a number of co-dependant attributes, only one of these was used in the analysis in order to prevent double or triple scoring of essentially the same attribute. In the case of threatened species status, both Commonwealth and State values were used,

since they are appraised through separate processes and thus may differ markedly. A table of attributes and the values used in the analysis is presented below.

The mapping derived from this process was used to identify Environmentally Sensitive Areas and formed the basis for the development of the constraints mapping presented in **Section 7**.

Table 3 Attributes and values used in the assessment of Environmentally Sensitive Areas

Attribute	Category	Value	Comments
EPA's Environmentally Sensitive Areas Mapping	A	2	
	B	1	
Threatened Ecological Communities		2	Identified through RE mapping units.
Threatened Species (EPBC Act)	Extinct	0	Extrapolated to the underlying RE polygon.
	Extinct in the wild	0	
	Crit. Endangered	4	
	Endangered	4	
	Vulnerable	3	
	Cons. Depend.	1	
	Not listed	0	
EPBC Act Listed Taxa (NC Act)	Extinct	0	
	Endangered	4	
	Vulnerable	4	
	Rare	1	
	Common	0	
BAMM Crit.A Habitat for EPBC Act Listed Taxa		4	
BAMM Crit.B Ecosystem Value (State)	Endangered	3	
	Of Concern	2	
	Not of concern	1	
	Non-remnant	0	
BAMM Crit.C Tract Size	Very High	4	
	High	3	
	Medium	2	
	Low	1	
	0	0	
BAMM Crit.D Rel. Size of RE (State)	Very High	4	
	High	3	
	Medium	2	
	Low	1	

BAMM Crit.E Condition		-	Not used.
BAMM Crit.F Ecosystem Diversity	Very High	4	
	High	3	
	Medium	2	
	Low	1	
BAMM Crit.G Context & Connection	Very High	4	
	High	3	
	Medium	2	
	Low	1	
	0	0	
BAMM Crit.H Habitat for Priority Taxa		2	Extrapolated to the underlying RE polygon.
BAMM Crit.I Special Biodiversity Values		2	
BAMM Crit.J Corridors		-	Represented in the values by Crit. C and G.
BAMM Crit.K Threatening Processes		-	Not used.

5.0 EXISTING ENVIRONMENT

5.1 Floral environment

The CSG Field encompasses vegetated and cleared grazing lands, cropping lands, roadside and travelling stock reserves, Council lands, State Forests and Resource Reserves.

Based on the Queensland Herbarium RE mapping, approximately 297,445 ha of the total 468,700 ha CSG Field area is cleared. The remnant vegetation in the CSG Field equates to 171,255 ha and consists of approximately:

- 149,414 ha of Eucalypt woodlands
- 975 ha of Acacia woodlands
- 3,617 ha of Brigalow / Belah woodland
- 621 ha of Semi-evergreen Vine Thicket
- 6,693 ha of riparian Eucalypt woodland
- 9,824 ha of shrubland on scalds, and
- 111 ha of wetlands.

Table 4 indicates the EPBC-listed communities that were identified in the CSG Field, the sites where field assessments were carried out and an estimate of the extent of these communities within a 200km x 200km region of the CSG Field and within the overall Bioregion.

The Tertiary flora assessment data sheets are included in **Attachment 7** of **Appendix 3.2**. A complete flora list for the CSG Field is provided in **Attachment 9** of **Appendix 3.2**.

Table 4 Threatened Ecological Communities within the CSG Field

Ecological Communities / RE		Status (EPBC)	Area within CSG Field (ha)	Sites	Area within 200*200km sq (ha)	% within 200*200km sq	Area within Bioregion (ha)	% within Bioregion
RE	Description							
RE 11.3.1	*Acacia harpophylla* and / or *Casuarina cristata* open forest on alluvial plains	E	461	T8,T9,T11,T25,T26	3,668	12.6	77,207	0.6
RE 11.3.2	*Eucalyptus populnea* woodland on alluvial plains	E (in part)	4,322	T3,T13, T28,Q19, Q49,Q70,Q73,Q82, Q85	32,494	13.26	3,141,616	0.1
RE 11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	E	1,570	T33, T43, Q2, Q3, Q16, Q41	28,822	5.4	76,888	2.0
RE 11.4.7	Open forest to woodland of *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* on Cainozoic clay plains	E	11	Not accessible	3,576	0.3	20,847	0.1
RE 11.4.10	*Eucalyptus populnea* or *E. pilligaensis*, *Acacia harpophylla*, *Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	E	193	T35	955	20.16	44,249	0.4
RE 11.8.3	Semi-evergreen vine thicket on Cainozoic igneous rocks. Steep hillsides	E	8	Not accessible **	526	1.5	26,482	0.0
RE 11.9.4	Semi-evergreen vine thicket or *Acacia harpophylla* with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks	E	613	T44, Q18	5,127	12.0	56,888	1.1
RE 11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	E	1,175	T17, T39, T45, Q1, Q37, Q42	15,205	7.7	145,844	0.8
RE	*Acacia melvillei* ± *A.*	E	9	Not accessible **	279	3.1	378	2.3

Ecological Communities / RE		Status (EPBC)	Area within CSG Field (ha)	Sites	Area within 200*200km sq (ha)	% within 200*200km sq	Area within Bioregion (ha)	% within Bioregion
RE	Description							
11.9.6	*harpophylla* open forest on fine-grained sedimentary rocks							

* E = Endangered ** Not accessible and recommended “Very High Constraint” areas based on values and sensitivities.

5.1.1 EPBC Act Listed Ecological Communities

The CSG Field is known to contain two EPBC Act Listed Ecological Communities listed as Endangered under the EPBC Act (**Table 4**). These are represented by eight Queensland Regional Ecosystems, namely:

- Brigalow woodland / open forest communities –, REs 11.3.1, 11.4.3, 11.4.7, 11.4.10, 11.9.5, and 11.9.6, and
- Semi-evergreen vine thicket communities –RE 11.8.3 and 11.9.4.

The six Brigalow communities occur on fertile soil areas within areas predominantly cleared of remnant vegetation throughout the CSG Field. The Brigalow remnants are almost always small and narrow fragments which have been left along fencelines, creeks and roadsides. Two slightly larger patches occur in north-western areas of the CSG Field in Cherwondah State Forest (i.e., PL171; **Figure A.14 [QC02-T-MA-0032]**). The small patches were generally found to be degraded due to edge effects including weed invasion and fire damage Small patches of Brigalow, of relatively high quality were observed in Braemar and Condamine State Forests.

According to Queensland Herbarium mapping the REs 11.4.3 and 11.9.6 have an area within the CSG Field that equates to at least 2% of that type of RE found within the Bioregion.

Field surveys verified the occurrence of a mapped RE 11.4.3 remnant (T33). It was found to be in a degraded condition due to edge effects such as weed invasion. The total area of RE 11.4.3 found within the CSG Field is approximately 1,570ha. This equates to approximately 2% of this type of RE found within the Bioregion.

The total area of RE 11.9.6 located within the CSG Field is mapped as approximately 9 ha which equates to 2.2% of this type of RE found within the Bioregion.

According to existing maps the areas of REs 11.3.1, 11.4.1, 11.4.7, 11.4.10, 11.9.5 found within the CSG Field equate to less than 1% of that which occurs in the Bioregion. With the exception of RE 11.4.7, the presence of these REs were verified during the field surveys (T8, T9, T11, T17, T25, T26, T35, T39, T45). The condition of these areas was found to vary from degraded to very good. Two sites deemed to be in very good condition were roadside remnants of RE 11.3.1 (T25 and T26). These remnants contained low numbers of weed species. Two remnants of RE 11.9.5 (T39 and T45) were surveyed and found to be degraded due to past land practices such as grazing and logging.

The SEVT communities occur on deep red soils with clay subsoil and are confined to the northern part of the CSG Field. The SEVT remnants are typically small fragmented patches, although two larger ones occur in the northwest as illustrated in **Figure A.15 [QC02-T-MA-0033]**. The small patches are degraded by edge effects including weed invasion and fire damage.

Due to access constraints no areas of the RE 11.8.3 (8 ha in total) were assessed during the field surveys. In this case the Herbarium mapping is assumed to be correct. The area of RE 11.8.3 mapped as occurring with the CSG Field is estimated to be 1.1% of that which occurs within the Bioregion.

Field surveys of a mapped remnant of RE 11.9.4 found the area to be highly degraded due to habitat fragmentation and the presence of environmental weeds

such as Buffel Grass (*Cenchrus ciliaris*). The total area of RE 11.9.4 estimated within the CSG Field is approximately 613 ha. This equates to approximately 1.1% of this type of RE found within the Bioregion.

An additional Threatened Ecological Community which may occur within the CSG Field is the Endangered Weeping Myall Open Woodland Community. This Community is not mapped by the Queensland Herbarium RE mapping nor was it detected by the initial field studies. However, it is described by DEWHA (2008ads) as occurring within the Brigalow South Bioregion, generally in small patches of alluvial soils within REs 11.3.2 and 11.3.28. As such, it may potentially occur in alluvial areas within the CSG Field.

Other EPBC Act Listed communities identified as potentially present by the EPBC database includes Endangered Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregion (North and South). The existing Queensland Herbarium RE mapping indicates that no remnant of this Ecological Community occurs within the CSG Field. Likewise, the field survey did not locate this community in the CSG Field.

The proportion of each of the Brigalow and SEVT REs which occur within the CSG Field is less than 13% of that found in a 200 km x 200 km area centred on the CSG Field and less than 2.4% of that found in the Bioregion. An exception to this is RE 11.4.10 for which the area contained in the CSG Field represents approximately 20% of that which occurs in the broader 200 km x 200 km buffer and 0.4% of that which occurs in the Bioregion.

5.1.2 EPBC Act Listed Flora Species

Review of the Queensland Herbarium HERBRECS, WildNet and the EPBC Act Protected Matters databases, for the study area identified 24 species listed under the provisions of the EPBC Act, including 3 Endangered, and 21 Vulnerable. The CSG Field contains the preferred habitat of 14 of these species (**Table 5**).

These species and their preferred habitats were targeted during the field survey work.

The known locations of EPBC Act Listed flora are presented in **Figures A.16-A.17** Note that as it is not possible to undertake detailed flora surveys for the entire CSG Field, and therefore EPBC Act Listed flora species will be found in many additional locations to those shown in **Figures A.16-A.17.** EPBC Act Listed flora species occur in a range of RE habitat types. Of particular note is the high incidence of EPBC Act Listed flora occurring in remnant vegetation on gravelly hilltops (i.e. Landzone 7) (**Figure A.18 [QC02-T-MA-0003]**).

Table 5 EPBC Act Listed Flora Species Recorded or With Preferred Habitat Within the CSG Field.

Common Name	Scientific Name	EPBC	Preferred Habitat	Preferred habitat present	Source ^	Herbrecs Site # / Field Survey Site #	Comments
None known	*Acacia chinchillensis*	VU	Sandy soils. Widespread but uncommon.	Yes	1,2,3,4	6/3	All sites were in RE 11.5.1 across the southern parts CSG Field. Confirmed Herbarium known site where the population consisted of twenty plants scattered over 1 ha. Also recorded at an additional location consisting of five individuals on a graded 10 m x 10 m area adjacent to an access track. Appears tolerant of disturbance.
Curly-bark Wattle	*Acacia curranii*	VU	Only known from Gurulmundi wildflower area in Gurulmundi State Forest.	Yes	1,2,3,4	6/2	Gurulmundi State Forest only. The majority within RE 11.7.5. Herbarium sites confirmed. Additionally an extra population recorded further from roads. Populations large, consisting of 100's of individual plants and spread across areas in excess of 1 km^2. Populations dense and in association with other EPBC Act Listed flora species (especially *Micromyrtus carinata*). Dense populations present in avoidable patches within RE 11.7.5. Affected by varying fire regimes through the State Forest but apparently fire tolerant/ loving.
Tara Wattle	*Acacia lauta*	VU	Found from Tara to Inglewood 1) Property "Marron Glen", 2) 15km nth of Tara and	Yes	1,2,3	1/0	Searched for the one known Herbarium site within the vicinity of the CSG Field north of Tara along Chinchilla-Tara Rd. Not able to be located. An inability to locate likely to be due to the scale of

Common Name	Scientific Name	EPBC	Preferred Habitat	Preferred habitat present	Source ^	Herbrecs Site # / Field Survey Site #	Comments
			3) 16km east of Tara.				accuracy, possibly due to the scale of Herbarium accuracy (+/- 12.5km).
None known	*Acacia wardellii*	VU	Ridge crests with loamy or gravely soil. Coloniser of disturbed areas – Thomby Range and a few ridges east of the Condamine.	Yes	1,2,3,4	6/2	Populations recorded east of Condamine. Verified Herbarium record and found one other very large population which spread for 1 km along a pipeline easement. The population consisted of two trees with large numbers of young spreading along the pipeline by construction activities. Tolerant of disturbance.
Ooline	*Cadellia pentastylis*	VU	Clay plains, sandstone and residual ridges in association with vine thickets, brigalow, belah and red bauhinia.	Yes	1,2,3,4	1**/1***	Observed in north-easternmost CSG Fields. Single trees scattered through grazing paddocks. Also likely in SEVT patches (not visited due to access constraints). Possible elsewhere in CSG Field but none observed.
None known	*Calytrix gurulmundensis*	VU	Found on lateritic sandstone ridges. Localised and patchy distribution.	Yes	1,2,3,4	4/1	Gurulmundi State Forest only. Found within RE 11.7.5 Verified Herbarium site and found additional small isolated patches spreading along access tracks. Appears that grader activities have spread plants along access tracks radiating out from a main population which is spread over an area of several square kilometres. Plants dense in sunlight exposed locations and sparse in shaded areas. Appears tolerant of disturbance.
None	*Commersonia*	VU	Stony ridges,	Yes	1	0/0	Neither Herbarium records nor field

Common Name	Scientific Name	EPBC	Preferred Habitat	Preferred habitat present	Source ^	Herbrecs Site # / Field Survey Site #	Comments
Known	*argentea*		north of Chinchilla				surveys recorded this species within or in the vicinity of the CSG Field.
Small-leaved Denhamia	*Denhamia parvifolia*	VU	Found in semi-evergreen vine thickets. Brown loam or clay loam soils.		1,3	0/0	Neither Herbarium records nor field surveys recorded any sighting of this species within the CSG Field.
None Known	*Diuris tricolor (sheaffiana)*	VU	Sandy soils, often in Callitris woodlands. Primarily a NSW species with scattered records in Qld.	Yes	1,2	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
Shiny-leaved Ironbark	*Eucalyptus virens*	VU	Sandstone ridges. Four populations – 1) Coolmunda Conservation Park 2) Tara, 3) NE of Eidsvold and 4) Maranoa River near Mt Moffatt.		1,2,3	0/0	Herbarium records indicate one sighting of this species approximately 3km from the central areas of the CSG Field. Field surveys did not record this species anywhere within the CSG Field.
None known	*Homopholis belsonii*	VU	Erect or ascending perennial to 40cm tall with panicles up to 25cm x 20cm. Known from near		1,3	0/0	Herbarium records show one tentative sighting on the outskirts of the northern eastern areas of the CSG Field, north east of Miles. Field surveys did not record this species anywhere within the CSG Field.

Common Name	Scientific Name	EPBC	Preferred Habitat	Preferred habitat present	Source ^	Herbrecs Site # / Field Survey Site #	Comments
			Gurulmundi, 30km north of Miles in the Darling Downs district (Stanley and Ross, 1989).				
None known	*Homoranthus decumbens*	VU	Found in two separate locations 1) Blackdown Tablelands and 2) State Forest 302, north of Chinchilla.	Yes	3	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.
None known	*Philotheca sporadica*	VU	On residual lateritic rises: 1) north of Tara and 2) 12km east of Kogan.	Yes	1,2,3,4	9/10	Dominant in patches on laterized scalds through central parts of the CSG Field (e.g. in the vicinity of Graham's Road, Mary's Roads, Kogan and Braemar State Forest).Generally recorded within ironstone jump-ups (lateric duricrusts). Could also potentially be present in nearby nearby areas where suitable habitat occurs (e.g. RE 11.7.5).
None known	*Rhaphidospora bonneyana*	VU	Not known in CSG Field. Grows in gullies or on rocky mesas in ranges	Yes	1	0/0	Neither Herbarium records nor field surveys recorded this species within or in the vicinity of the CSG Field.

*Status EPBC: Australian Government listed: E = Endangered; V = Vulnerable
**: Known records outside of CSG Field
***: Field survey site same as Herbrecs

^: Source: 1 = EPBC Protected Matters search; 2 = WildNet; 3 = Herbrecs; 4 = Field survey for this study

5.1.3 Significant Weed Species

In 1999 the Commonwealth, State and Territory Governments finalised a list of 20 weed species to be classified as Weeds of National Significance (WONS). The main criteria for this listing were:

- The invasiveness of the weed
- The potential impact of the weed
- The potential for the weed to spread, and
- The socio-economic and environmental values. (DEWHA 2009)

Field surveys detected no WONS within or in the vicinity of the CGS Field.

Numerous environmental weeds were also recorded during field surveys. Species that may impede rehabilitation works following construction include:

- Maynes Pest (*Verbena tenuisecta)*
- Mimosa Bush (*Acacia farnesiana*); and
- Exotic pasture and roadside grasses, such as:
    - African Love Grass (*Eragrostis curvula*);
    - Buffel grass (*Cenchrus ciliaris*); and
    - Guinea Grass (*Megathyrsus maximus* - syn. *Panicum maximum*).

Many REs have been substantially degraded by Buffel and Guinea Grass, both of which have the capacity to displace native ground storey species and alter fire regimes irrevocably. Buffel Grass is now recognised as an emerging environmental weed of considerable importance (Best 1998; Clarke *et al*. 2005; Greenfield 2007). It is also widely used in the region as a pasture grass

5.2 Fauna Environment

5.2.1 Fauna Habitats

The CSG Field encompasses vegetated and cleared grazing land and cropping land, roadside and travelling stock reserves, Council lands, State Forests and Resource Reserves.

As described in the flora description the CSG Field is approximately 468,700 ha in size. Of this, 297,445 ha is cleared. The remnant vegetation in the CSG Field equates to 171,255 ha and consists of approximately:

- 149,414 ha of Eucalypt woodlands
- 975 ha of Acacia woodlands
- 3,617 ha of Brigalow / Belah woodland
- 621 ha of Semi-evergreen Vine Thicket
- 6,693 ha of riparian Eucalypt woodland
- 9,824 ha of shrubland on scalds, and
- 111 ha of wetlands.

Fauna habitats on most rural lands and roadside verges in the CSG Field are fragmented and substantially degraded. Most areas have a long history of grazing, timber removal and invasion by environmental weeds. Nevertheless, some areas, particularly riparian zones, have significant fauna habitat values with a relatively high percentage of hollow-bearing trees and moderate to high levels of understorey vegetation and leaf litter. The relatively moist riparian environments support more regular and heavy flowering eucalypt communities which are important food sources for many bird species. Two Little Red Flying Fox (*Pteropus scapulatus*) colonies were also found in the area at the time of the study and were observed to be feeding principally along these riparian areas.

The majority of Brigalow (*Acacia harpophylla*) woodlands and tall shrublands occur as narrow wind breaks between cultivated or grazed paddocks or along roadside verges. They are usually heavily infested with introduced grasses and their overall quality as fauna habitats is marginal in these areas.

All habitats (even cleared and degraded land), provide habitat for a range of common native fauna species. Remnant vegetation provides higher habitat values and thus will have a larger range of more common and abundant species.

From observations made during the surveys it seems likely that several factors have combined over a period of time to reduce biodiversity in the area. These factors vary in their influence across the region and also between habitat types. They include:

- Frequent cool winter fires that have removed ground cover in many habitats. These fires are likely to have removed food resources and exposed fauna to elevated predation risks (Garden *et al*. 2007b; Letnic 2007; Priddel *et al.* 2007)
- In the southern areas of the CSG Field, foxes are particularly abundant and these highly efficient predators are well known to pose a serious risk to

terrestrial fauna, particularly were ground cover is scant (Briggs et al. 2007; Gentle *et al*. 2007; McKenzie *et al.* 2007; Priddel *et al*. 2007; Salo *et al*. 2007)

- Grazing and the establishment of environmental weeds, particularly Buffel Grass (Cenchrus ciliaris) are a serious threat to the integrity of many fauna habitats. Buffel Grass is now becoming widely recognized as a serious environmental weed in natural habitats but is also an important pasture grass for graziers (Best 1998; Clarke *et al.* 2005; Greenfield 2007), and
- Grazing has also exerted significant pressure on many natural habitats and has substantially degraded understorey vegetation structure in some areas (Munro *et al*. 2007).

The survey found no bandicoots, bettongs or other terrestrial mammals in this size range in the CSG Field south of the Warrego Highway. Also notably absent were leaf litter dependent species such as Death Adders (*Acanthopis antarcticus*) and the Brigalow Scaly-foot (*Paradelma orientalis*).

A complete list of the fauna observed in the field is set out in **Attachment 10** of **Appendix 3.2**.

5.2.2 EPBC Act Listed Fauna Species

Database searches identified 29 fauna species listed under the EPBC Act and of these 24 were considered to potentially occur in the area. They include 1 Extinct, 4 Endangered, 12 Vulnerable, 11 Migratory and 6 Marine species.

A list of the EPBC Act Listed fauna species, together with their preferred habitat and an indication as to whether this habitat is present within the project area is given in **Table 6**.

EPBC Act Listed species identified by the EPBC MNES Database as potentially occurring within the region include the Murray Cod (*Maccullochella peelii peelii*) and the Fitzroy River Turtle (*Rheodytes leukops*). The study area is located in the Condamine River catchment which is part of the Murray-Darling system and Murray Cod have been recorded in the area. The Fitzroy River Turtle is however, confined to the Fitzroy River catchment to the north and does not occur in the project area. It has therefore been excluded from further consideration.

Table 6: EPBC Act Listed Fauna of the CSG Fields

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
Fish					
Murray Cod	*Maccullochella peelii peelii*	VU	Freshwater rivers: Murray-Darling System. Introduced to the Mary River, Fairbairn Dam and Cooper Creek.	Potential	No
Reptiles					
Brigalow Scaly-foot	*Paradelma orientalis*	VU	Dry sclerophyll and open woodlands in a wide variety of habitats.	Potential	No
Dunmall's Snake	*Furina dunmalli*	VU	In a wide variety of forest and woodland types on heavy clay soils and occasionally in adjoining sandy areas.	Potential	No
Yakka Skink	*Egernia rugosa*	VU	Widespread but uncommon, dry sclerophyll forest and woodlands, fallen logs, rock outcrops.	Potential	No
Five-clawed Worm Skink	*Anomalopus mackayi*	VU	Recorded in open woodlands with grassy understorey. Rare and poorly known.	Potential	No
Grassland Earless Dragon	*Tympanocryptus pinguicolla*	EN	Grasslands of black soil plains of the Darling Downs. Often found in cultivated paddocks with nearby grass cover.	Potential	No
Birds					
Swift Parrot	*Lathamus discolour*	EN	Occasional visitor to Qld when feeding on Eucalypt forests in winter. Breeds in Tasmania.	Potential occasional	No
Star Finch	*Neochima ruficauda ruficauda*	EN	Riverine habitats in tall grass. Not recorded from the region in the 1998-2002 Birds Australia Atlas.	Unlikely	No
Regent Honeyeater	*Anthochaera Phrygia*	EN, Mi	Dry Ironbark woodland associations. Irregular winter visitor to Qld.	Potential occasional	No
Paradise Parrot	*Psephotus pulcherrimus*	EX	Open grassy ironbark woodlands. Last reported 1927.	Unlikely	No
Australian Painted Snipe	*Rostratula australis*	VU	Marshes and swamps in tall grass.	Potential	No
Black-breasted Button-quail	*Turnix melanogaster*	VU	Dry rainforest and vine forest. Marginal in adjoining farmlands.	Potential	No

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
Plains-wanderer	*Pedionomus torquatus*	VU	Known only from Diamantina Shire, to the west of the project area.	Unlikely	No
Red Goshawk	*Erythrotriorchis radiatus*	VU	Patchy distribution in relatively large expanses of forest and woodland.	Potential	No
Squatter Pigeon (southern)	*Geophaps scripta scripta*	VU	Patchy distribution in dry eucalypt forest, often near water. Not recorded from the QGC fields – occurs further north.	Unlikely	No
White-bellied Sea Eagle	*Haliaeetus leucogaster*	Mi, Ma	Inland locations – permanent and often extensive freshwater lagoons and aquatic systems.	Unlikely	No
White-throated Needletail	*Hirundapus caudacutus*	Mi	Aerial forager, thought to sleep on the wing. A widespread, seasonal visitor to Australia. Unlikely to land in the project area.	Potential	Yes
Rainbow Bee-eater	*Merops ornatus*	Mi	Summer migrant, breeding in sand ridges and creek banks in many habitat types. Common.	Potential	No
Rufous Fantail	*Rhipidura rufifrons*	Mi	A common and widespread bird in a variety of habitat types but often preferring dense vegetation.	Potential	No
Great Egret	*Ardea alba*	Mi, Ma	Widespread in wetland habitats.	Potential	No
Cattle Egret	*Ardea ibis*	Mi, Ma	Common and widespread over much of Australia. Nomadic in arid areas.	Potential	No
Lathams Snipe	*Gallinago hardwickii*	Mi, Ma	Widespread in eastern Australia. Wetlands.	Potential	No
Australian Cotton Pygmy-goose	*Nettapus coromandelianus albipennis*	Mi	Widespread in eastern Australia. Aquatic; permanent freshwater lagoons, swamps and rivers. Often with dense aquatic vegetation.	Potential	No
Painted Snipe	*Rostratula benghalensis*	Mi	Marshes and wetlands	Potential	No
Fork-tailed Swift	*Apus pacificus*	Mi, Ma	Aerial insectivore, widespread distribution.	Potential	Yes
Magpie Goose	*Anseranus semipalmata*	Ma	Marshes and swamps	Potential	No, (seen at Lake Broadwater on the eastern margin of the CSG Field)

Common Name	Scientific Name	STATUS	Habitat	Probability of occurrence	Field Survey Record
Mammals					
Eastern Long-eared Bat	*Nyctophilus timoriensis*	VU	Widespread but uncommon in dry forests and woodlands from Vic to central south Qld.	Potential	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	VU	Patchily distributed in association with sandstone escarpments but also occurs in eucalypt forests and woodlands.	Potential	Tentative Record at Gurulmundi SF

***Status:** Commonwealth (EPBC) listed: **EX** = Extinct; **CE** = Critically Endangered; **EN** = Endangered; **VU** = Vulnerable; **Mi** = Migratory Species, **Ma** = Marine Species.

Field studies identified four EPBC Act Listed fauna species within the CSG Field. These are:

- Eastern Long-eared Bat (*Nyctophilus timoriensis*)- Vulnerable under the EPBC and the NC Act
- White-throated Needletail (*Hirundapus caudacutus*) – Migratory species
- Fork-tailed Swift (*Apus pacificus*) – Migratory and Marine species, and
- Large-eared Pied Bat (*Chalinolobus dwyeri*)- Vulnerable under the EPBC (Tentative Record at Gurulmundi SF).

Field surveys also recorded one additional threatened fauna species at Lake Broadwater, just outside the south-east corner of the CSG Field:

- Magpie Goose (*Anseranus semipalmata*) – Marine species.

All records of protected fauna have been submitted to the EPA WildNet database.

EPBC Act Listed fauna species recorded during the survey are described below.

Eastern Long-eared Bat, *Nyctophilus timoriensis*

EPBC: Vulnerable

This species was encountered only once during the survey in a relatively extensive tract of natural vegetation near Condamine. Previous records are also known from this area and also to the north of Miles near Gurulmundi State Forest. Other records are known from areas to the south and south-east of the CSG Field and the species is recorded infrequently across the NSW and Queensland Brigalow Belts. It is likely therefore, that this species occurs throughout the CSG Field, possibly restricted to larger tracts of intact native vegetation. The draft Biodiversity Action Plan for EPA Back on Track species in the Murray-Darling Region (EPA 2008d) indicates habitat fragmentation as a major threat to this species.

Large-eared Pied Bat, *Chalinolobus dwyeri*

EPBC: Vulnerable

Additionally, an echo-location call of an unknown bat species was recorded on the rocky escarpments in Gurulmundi State Forest. The call is similar to that reported for the EPBC Act Listed Large-eared Pied Bat (Pennay, et. al. 2004) but the identification can not be confirmed until further reference calls are obtained for this species. For the purposes of this report, a conservative approach is taken and this species has been assumed to occur in areas where suitable habitat exists.

White-throated Needletail, *Hirundapus caudacutus,* EPBC: Mi, and **Fork-tailed Swift, *Apus pacificus*,** EPBC: Mi, Ma

These birds were observed in the air space over the CSG Field and as in other parts of the continent, it is highly unlikely that they land. Both species possibly sleep on the wing and were observed flying ahead of summer storm fronts in the area. These birds are reliant upon flying insects that may originate in the CSG Field area, but it is highly unlikely that they would be affected in any way by the proposed development.

Overall distributional range is restricted to the Brigalow Belt Bioregion.

5.2.3 Aquatic Fauna

Queensland Museum and WildNet records list 18 species of fish from the catchment in the QGC Field, two of which are introduced.

One species, the Murray Cod, is listed as vulnerable under the EPBC Act.

5.2.4 Introduced Fauna

Eleven introduced species have been recorded within the wider area, including one amphibian, three birds, seven mammals and two fish. These species are included in **Attachment 10** of **Appendix 3.2**, where they are denoted as introduced species by an asterisk.

5.3 Wetlands

The Condamine and Balonne Rivers drain the region of the CSG Fields towards the southwest. Outside of the CSG Field, there are several nationally significant wetlands located on the lower Balonne River system including the Ramsar-listed Narran Lake Nature Reserve (which includes Back and Clear lakes) which is part of large terminal wetlands of the Narran River at the end of the Condamine system flowing out of Queensland. The Narran Lake Nature Reserve is approximately 450 km southwest of the QGC CSG Fields, in New South Wales.

In addition to the Narran Lake Nature Reserve there are two major wetlands within the Condamine catchment: Lake Broadwater Conservation Park and Resources Reserve 25km southwest of Dalby on the eastern boundary of PL269 and The Gums Lagoon 26km southwest of Tara outside the western boundary of EPP632 (**Figure A.19 [QC02-T-MA-0020]**). Lake Broadwater is classified as a Palustrine system with Lacustrine wetlands on the outskirts and supports four wetland communities: (i) open water communities (ii) lake edge communities (iii) marsh communities and (iv) riparian communities. The Gums Lagoon is classified as a Palustrine system with a relatively undisturbed wooded swamp in a small reserve of similarly undisturbed woodlands and open forest (QNPWS 2005). The Gums Lagoon supports 79 identified species of birds some of which are afforded special status under JAMBA and CAMBA. These bilateral agreements between Japan (JAMBA) and China (CAMBA) provide for the conservation of terrestrial, water and shorebird species that migrate between Australia and the respective countries.

5.4 Environmentally Sensitive Areas

5.4.1 Bioregional Planning Assessment Values

Conservation values across the CSG Fields vary markedly as a result of past and present land uses and the intensity of current rural residential, cropping and grazing regimes. Conservation values have been appraised in accordance with the EPA's Biodiversity Assessment and Mapping Methodology (BAMM) and also taking into account Environmentally Sensitive Areas as defined by the EPA in their Guideline "Assessment and Approval Process for Environmental Authorities for Petroleum Activities". Incorporated in the BAMM methodology, is specific appraisal of habitat for EPBC Act Listed taxa, ecosystem values, RE status (VM Act). For the purposes of this study, the status of threatened ecological communities (EPBC Act 1999) has been incorporated, based on their RE designations.

Summaries of EPBC Act Listed Taxa have been provided in previous sections. Other values appraised during the field work and added to the assessment of conservation values include the following.

5.4.2 Additional Flora Values

- Semi-evergreen Vine Thicket protected under EPBC Act and VM Act is exceedingly rare in the CSG Fields, occurring only in the Wooleebee Creek area and in northern parts of, and further north of, Gurulmundi State Forest. It

is afforded additional status as it contains taxa at the southern geographical extent of their range

- Areas mapped as ephemeral wetlands (RE 11.3.27) on the assumption that these areas have extant values (not able to be assessed in the field due to landholder constraints), and
- All areas of remnant vegetation on gravelly hill tops (i.e. Land Zone 7) within the QGC Fields. This RE is of particular importance as it contains a significantly large number of EVR taxa in the Gurulmundi area and also in the southern areas of the CSG Fields where it supports *Philotheca sporadica* and other EVR plants. This Landzone comprises open gravelly hill tops (lateritic duricrust) and is frequently targeted for gravel extraction.

5.4.3 Additional Fauna Values

- Riparian corridors with native vegetation. Within the tenements there are many small creeks and floodout areas, some of these are still well vegetated. They include the environs of Wambo Creek, Wilkie Creek, Moramby Creek, Braemar Creek and the Condamine River. These areas contain a high proportion of hollow trees and are important dry season refuges and breeding areas.
- Gurulmundi area, in particular:
  - Topography over most of the CSG Field is relatively flat, however there are significant escarpments above steep boulder-strewn creeklines in the Gurulmundi State Forest area which are important refuges and also likely to provide habitat for uncommon species. This was the only area within the CSG Fields where the east-coast form of the Wallaroo (Macropus robustus robustus) was recorded
  - Bat calls recorded in this area may be those of the Large-eared Pied Bat (*Chalinolonbus dwyeri*) and footprints seen in the several caves may be those of a Northern Quoll (*Dasyusus hallucatus*). Further survey effort would be required to confirm these records, however, for the purposes of this assessment a precautionary approach will be taken and therefore it will be assumed that these species occur in the area, and
  - Based on all known values, the Gurulmundi area qualifies as an important fauna refuge and area of high species richness.

5.4.4 Environmentally Sensitive Areas Mapping

Based on the analysis of these criteria and the methodology described in **Section 4.4**, a map of Environmentally Sensitive Areas has been developed (**Figure A.20 [QC02-T-MA-0021]**).

6.0 POTENTIAL IMPACTS

6.1 Reversible and Non-reversible Impacts

Once infrastructure has been developed, there is potential to allow vegetation to re-establish over a portion of the area originally cleared. Bore pads are 10 000m^2 (1 ha) in extent for construction but can be revegetated around the edges provided that 5000 m^2 around the established well remains vegetation free. Similarly road verges can be allowed to revegetate once wide clearance vehicles used in construction are withdrawn. Where flowlines are laid, a portion of the ground surface can be allowed to revegetate. Keeping a narrow strip of ground over the flowline, free of trees and shrubs may be all that is necessary to protect it from potential root damage and facilitate ongoing inspection and necessary maintenance.

With the typical well life being up to 25 years, wells and the associated flowlines and access roads will be progressively rehabilitated over the life of the Project. Rehabilitation activities will commence sequentially at ramp-down/cessation of commercial production for depleted wells.

As such, subject to landholder property management practises, it is expected that over the medium term (20 - 50 years) significant portions of the originally modified areas will be rehabilitated and allowed to naturally regenerate.

Longer-term, the CSG Field is likely to be decommissioned within several decades. Subject to the exception that landholders may choose to manage their properties in a manner that inhibits natural regrowth; the impacts associated with the clearing of vegetation for construction and maintenance are considered to be reversible in the long term.

6.2 Potential Impacts on EPBC Act Listed Ecological Communities

Regional Ecosystem mapping (EPA) indicates that approximately 50% of the CSG Field supports remnant vegetation. The majority of this consists of eucalypt woodlands and forests with very minor, fragmented stands of brigalow often occurring on roadside verges or as wind breaks along the margins of pasture or cropping paddocks. Some clearing of these remnant ecological communities will be required. Mostly, this will involve the clearing of relatively narrow, linear corridors and pad footprints in eucalypt communities.

The total known area of EPBC Act Listed Ecological Communities in the CSG Field is estimated to be 4,039 ha. The worst case clearing scenario would amount to the removal of approximately 117.1 ha, which equates to approximately 0.009% of the threatened communities found within the Bioregion. It should be emphasised, however, through existing and proposed avoidance / minimisation measures and the establishment of direct offsets this worst case clearing scenario will be reduced to zero.

6.2.1 Other Potential (non-clearing) Impacts on Threatened Ecological Communities

Other potential detrimental impacts include:

- The movement of machinery and vehicles between areas, which has the potential to spread weeds including a number of environmental and declared noxious species, such as Buffel grass, Parthenium Weed and Giant Rat's-tail Grass
- The introduction or proliferation of pest fauna species

- Changes to fire regimes, in particular increased fire regimes due to higher to weed biomass along cleared alignments
- The activities of machinery and construction operations may increase the likelihood of wildfires
- Initial drilling activities result in the production of associated water which is very mildly saline (generally 2,000-5,000 ppm), and so vegetation in the vicinity of the wells may be impacted if water tables are affected or if extracted water flows into nearby vegetation, and
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

Due to the closed nature of Brigalow and SEVT communities, these areas are particularly sensitive to indirect impacts such as fragmentation, weed invasion and altered fire regimes. The invasion of these communities by exotic weed species (e.g. Buffel Grass) provides increased fuel loads which can lead to the increased occurance of wildfire and the subsequent damage to the lower tree layer.

6.3 Potential Impacts on EPBC Act Listed Flora Species

All EPBC Act Listed flora species identified in the CSG Field may be subject to some of the potential impacts described in the previous section, namely:

- Clearing for the construction of roads and pads for gas drilling and extraction
- The activities of machinery and construction operations may increase the likelihood of wildfires, and
- The project could potentially bring about beneficial affects through the establishment of environmental offsets and land management initiatives, aimed at protecting and improving knowledge of the distribution and threats to EVR flora species in the CSG Field.

There is higher potential for clearing activities within Landzone 7 to impact particular EPBC Act Listed flora species (i.e. *Acacia curranii, Calytrix gurulmundensis* and *Philotheca sporadica*).

The potential for weed species to significantly impact any EPBC Act Listed flora species within the CSG Field is considered to be low due to the fact that either:

- The niches in which they occur are generally not suitable for the establishment of significant populations of exotic species, or
- Where this is not the case, the preferred habitats are generally already dominated by Buffel Grass, Green Panic or other pasture grasses.

Table 7 summarises the potential for each EPBC Act Listed flora species to be impacted by the proposed activities with and without mitigation measures. Mitigation measures to address these potential impacts are detailed in **Section 7**.

Table 7 Potential for EPBC Act Listed Flora Species to be Impacted

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
None known	*Acacia chinchillensis*	VU	Sandy soils. Widespread but uncommon.	High	Planning Survey and Clearance Surveys, Fire Management	Low (easily avoidable)
Curly-bark Wattle	*Acacia curranii*	VU	Only known from Gurulmundi wildflower area north of Miles. The majority within RE 11.7.5.	Very high (restricted species)	Planning and Clearance Surveys (potentially widespread restrictions in Gurulmundi SF and wildflower area) , Fire Management	Potentially High in Landzone 7 within Gurulmundi area, low elsewhere
Tara Wattle	*Acacia lauta*	VU	Found from Tara to Inglewood 1) Property “Marron Glen”, 2) 15km north of Tara and 3) 16km east of Tara. Recorded within and in the vicinity of the south-eastern areas of the CSG Field, just north of Tara.	High	Clearance Survey, Fire Management	Low (easily avoidable)
None known	*Acacia wardellii*	VU	Ridge crests with loamy or gravely soil. Coloniser of disturbed areas – Thomby Range and a few ridges east of the Condamine.	High	Clearance Survey, Fire Management	Low (restricted habitat type, easily avoidable in most cases)
Ooline	*Cadellia pentastylis*	VU	Clay plains, sandstone ridges. Localised and patchy distribution in Gurulmundi and Barakula areas.	High	Clearance Survey, Fire Management	Low (low numbers anticipated, easily avoided)
None known	*Calytrix gurulmundensis*	VU	Found on lateritic sandstone ridges. Localised and patchy distribution.	Very high (restricted species)	Exclusion areas at Gurulmundi. Clearance Surveys, Fire Management	Potentially High in Landzone 7 within Gurulmundi State Forest, low elsewhere
None known	*Commersonia*	VU	Stony ridges, north of	Low (not known in	Clearance Surveys	Low (easily avoided)

Common Name	Scientific Name	Status	Habitat	Potential to be Adversely Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Adversely Impacted with Mitigation Measures
	argentea		Chinchilla	the CSG Field)		
None known	*Denhamia parvifolia*	VU	Not known in CSG Field.Found in semi-evergreen vine thickets. Brown loam or clay loam soils.	High	Clearance Survey, Fire Management	Low (low numbers anticipated, restricted habitat type, easily avoided)
None known	*Diuris tricolor (sheaffiana)*	VU	Sandy soils, often in Callitris woodlands. Primarily a NSW species with scattered records in Qld.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
Shiny-leaved Ironbark	*Eucalyptus virens*	VU	Type collected from Gurulmundi SF. Restricted to Landzone 7.	High	Clearance Survey, Fire Management	Potentially High in Landzone 7 within State Forests, low elsewhere
None known	*Homopholis belsonii*	VU	Not known in CSG Field.Dry woodland on sandy soils.	High	Clearance Survey, Fire Management	Low (easily avoidable for well sites, offsets required)
None known	*Homoranthus decumbens*	VU	Found in two separate locations 1) Blackdown Tablelands and 2) State Forest 302, north of Chinchilla.	Low (not known in the CSG Field)	Clearance Surveys	Low (easily avoided)
None known	*Philotheca sporadica*	VU	On residual lateritic rises: 1) north of Tara and 2) 12km east of Kogan.	Very High	Clearance Survey, Fire Management	Potentially high in Landzone 7 within the central parts of the CSG Field (e.g. in the vicinity of Graham's Road, Mary's Roads, Kogan and Braemar State Forest).
None known	*Rhaphidospora bonneyana*	VU	Not known in CSG Field. Grows in gullies or on rocky mesas in ranges	High	Clearance Survey, Fire Management	Low (low numbers anticipated, restricted habitat type, easily avoided)

***Status:** Commonwealth (EPBC) listed: **VU** = Vulnerable

As detailed in **Table 7**, the unmitigated potential for the Project to impact on EPBC Act Listed flora is:

- Very high for three species,
- High for eight species and
- Low for three species

Table 7 also describes how the use of the mitigation measures detailed in **Section 7** would enable the Project to avoid significantly impacts to all EPBC Act Listed flora. However, this assumes that non-linear CSG activities will not be conducted within Gurulmundi State Forest. Prior to separate government endorsement of plans to undertake CSG activities within this area based on detailed ecological evidence that such activities would be conducted without risk of significant impact on MNES. If this is not the case, there would be potential for significant impacts on three EPBC Act Listed flora species.

6.4 Potential Impacts Associated with Weeds of National Significance (WONS) and Environmental Weeds

Construction and maintenance of the wells and associated infrastructure has the potential to introduce new weeds and spread existing ones.

Of particular significance to landholders will be the potential to introduce WONS to areas within and in the vicinity of the CSG Field including those already present. Introduction and spread of these weed species can render land less productive and in some cases have serious health impacts on livestock and people. The weed species Parthenium (*Parthenium hysterophorus*) is of particular interest to landholders and the community due to its potential impacts on agricultural productivity and human health. Parthenium is not currently known within the CSG Field nevertheless it is believed to occur in nearby areas.

Construction and maintenance activities in the CSG Field also have the potential to spread environmental weeds into ecosystems that are currently in a natural condition. Of particular concern is Buffel Grass (*Cenchrus ciliaris*). This species is an introduced and highly valued pasture grass in many areas but also has the potential spread into native communities and conservation areas where it out-competes native species. It often causes an increase in biomass which drastically biases fire regimes towards much more intense and frequent fire events which can destroy natural ecosystems. The grass itself also provides very little nutritive or forage value for wildlife and so, areas dominated by the Buffel grass can quickly become biological deserts.

Other environmental weeds of significance are Castor Oil (*Ricinus communis*), Mexican Poppy (*Argemone ochroleuca*), Mimosa Bush (*Acacia farnesiana*) and Guinea Grass (*Megathyrsus maximus*).

Good weed hygiene practices should be adopted to minimise the introduction or spread of WONS and environmental weeds in the QGC Field. Recommendations aimed at controlling the introduction and spread of weed species are provided in **Section 7**.

6.5 Potential Adverse Impacts on EPBC Act Listed Fauna

Clearance of native vegetation will be required for the construction of roads, pipelines, well site pads and other infrastructure. It is expected that these impacts will be reduced over time as cleared areas partially revegetate post construction of CSG field infrastructure.

Overall levels of vegetation disturbance are considered to be low with the total anticipated amount of clearing likely to cause a reduction in extent of vegetation of approximately 3%, spread relatively evenly across the CSG Field.

As detailed in **Section 7**, the project infrastructure locations will be selected to avoid areas identified as having highest significant conservation values as derived from the constraints mapping. Nevertheless, some potential impacts would remain and these include the following:

- Removal of habitat such as mature vegetation, hollow-bearing trees and fallen logs, and therefore loss of nesting, shelter and foraging resources
- Fragmentation of habitat due to flow line and access road construction. These features may act as movement barriers, particularly to fossorial[1] species, and alter movement patterns. They may also limit access to dry season fauna refuges associated with riverine environments
- Access for predators – dingoes and to a lesser extent, foxes and cats are known to follow roads and tracks as they provide easy access paths. This may open up new habitats and expose fauna to elevated predation risks
- The establishment of environmental weeds, particularly Buffel grass, have the potential to destroy natural fauna habitats through altered fire regimes and removal of fauna food resources
- Noise and increased human activity, particularly during site development may restrict species movements and limit access to food or other resources
- The potential for road kills along access tracks will elevate mortality risks for some species
- Sedimentation and nitrification of aquatic habitats, and
- Accidental release of associated water with higher levels of salinity from evaporation ponds or other associated water infrastructure.

Discussion of each of these potential impacts follows.

6.5.1 Removal of Tree Hollows and Vegetation

Removal of mature vegetation reduces feeding resources and shelter for native fauna species. While it is recognised that the proposed loss of mature vegetation would not be significant, some parts of the CSG Field have been heavily cleared and are now severely fragmented.

An important potential impact on fauna is the loss of hollow-bearing trees. A large number of Australian vertebrate fauna species are dependent on tree hollows for shelter and nesting, including (amongst others) parrots, owls, possums, gliders and bats (Gibbons and Lindenmayer, 2002). Mature trees with hollows are a limited

[1] burrowing

resource in this region and are largely confined to riparian corridors and areas of mature, intact forest. During the initial tertiary surveys birds such as galahs were observed nesting in degraded fragments of roadside vegetation where large hollows existed. Thus all forest and woodland fragments with large trees should be considered as potentially important fauna habitat. The formation of hollows suitable for use by fauna does not occur until eucalypts are at least 120 years. Therefore, the replacement of lost hollows may not occur for very long periods.

Fallen logs and dead timber on the ground and understorey vegetation provide shelter (either underneath timber or within hollow logs) and food resources for a broad range of small ground-dwelling fauna. These include, but are not exclusive to, native rodents, dasyurid marsupials, bandicoots, lizards, snakes, frogs, and some birds. For example, during the detailed fauna surveys, Rufous Bettongs were only recorded in association with dense understorey vegetation. The loss or removal of fallen timber and understorey vegetation severely reduces the abundance and diversity of small ground-dwelling fauna. Impacts from removal of dead timber and understorey vegetation will reverse over time as affected areas revegetate but reduction in abundance of some species is likely to occur in the short to medium term.

6.5.2 Habitat Fragmentation

The CSG Field includes riparian Eucalypt woodlands and forests which have important fauna values as refugia for wildlife during dry periods and as corridors, facilitating the movement of migratory and nomadic species. Such refugia and corridors are particularly important because much of the wider environment of the study corridor is fragmented due to clearing for agriculture. Additionally these watercourses are often the only source of water during the dry season and therefore enable populations to persist in a dry and largely cleared landscape. Fragmentation and disturbance or these habitats may be reversible in the medium to long term by natural revegetation and habitat rehabilitation or specific programs aimed at restoring habitat.

Whilst it is recognised that the vast majority of vegetated areas are already extensively criss-crossed with fire-breaks, fencelines and roads, the clearing for proposed project infrastructure will increase the degree of existing habitat fragmentation. This impact is somewhat reduced by the fact that the proposed clearing will generally consist of narrow, linear strips (as access tracks and flowlines are developed). This impact will be more significant in relatively intact vegetation areas (particularly in State Forests) and less significant where ground and shrub layers have been degraded by existing land uses, such as grazing, and fire and weed impacts.

Fragmentation and disturbance of these habitats may be reversible in the medium to long term by revegetation and habitat rehabilitation programs.

6.5.3 Access by Predators

Predators such as dingoes, and to a lesser extent, foxes and cats, are known to use roads and tracks extensively as they provide rapid and unrestricted access across the landscape and the relative lack of contact with vegetation also ensures minimal parasite contact. Tracks also have the potential to open up dense understorey habitats which may provide refugia for fauna.

6.5.4 Environmental Weeds

The movement of machinery and vehicles may facilitate the spread of weeds species, some of which are highly invasive once established are very difficult and costly to eradicate. Of particular concern in relation to potential impacts on native fauna is the environmental weed Buffel Grass (*Cenchrus ciliaris*). This grass has the potential to spread and out-compete native species in a variety of habitat types. Its increased biomass may also predispose infested habitats to more intense and frequent fire events. It is also of very little nutritive value to fauna and seeds are inedible to many grainivorous birds. Areas that are heavily infested with Buffel Grass often become 'biological deserts' where few native fauna can survive. Buffel Grass can be poisoned; however seeds remain viable for many years and can germinate quickly after rainfall events, with young plants flowering and setting seed in little more than a week. Thus once established in native plant communities, it can be extremely difficult to eradicate.

A somewhat different situation exists in pastoral areas where Buffel Grass is highly valued as a pasture grass.

Areas currently free of Buffel Grass include the floodplain communities in the southern parts of Gurulmundi and other parts of the State Forest where grazing pressure has been minimal.

Many Brigalow communities are already significantly degraded by Buffel Grass and Green Panic. As such, there is an opportunity for this project to improve management of these areas to reduce the abundance and biomass of these grasses and thus to improve fauna and flora habitat values within these areas.

6.5.5 Noise and Human Activity during Construction

Construction activities involve high levels of human activity and noise. This may disrupt some fauna, particularly if these activities occur near important roosting or breeding sites. Often such sites are used by a particular species because the site has significant microclimatic attributes, freedom from predators and/or proximity to food resources. As such, disturbance to these sites can seriously jeopardise species survival in some instances. The disturbance however, is anticipated to be temporary and so impacts will be short-term. It will be necessary to include fauna habitat assessments in site clearance procedures to check for nesting birds, important roosts (e.g. Barking Owl, microbat and flying fox daytime roosts) and key habitats such as rock outcrops and cliff faces/gorges.

6.5.6 Increased Levels of Fauna Road Kill

The construction of roads and general increase in human activity in the CSG Field will increase levels of fauna road kill. Road kills are often most frequent at night, in the very early morning and evening when many species are most active. Most human activity along roads will likely occur during the day and unsealed roads are negotiated at low speed, thus road kill impacts are anticipated to be limited, however, monitoring of road kills in areas of high conservation value and response strategies (e.g. reduced speed zones) are recommended in **Section 7**.

6.5.7 Sedimentation, Nutrification and Accidental release of saline water to watercourses and wetlands

The potential for the Project to impact on aquatic habitats through sedimentation, nutrification and accidental release of saline water is described in **Section 6.7**. Any such impacts would affect wetland fauna species.

6.5.8 Potential Beneficial Impacts on Habitat for EPBC Act Listed Fauna

The overall condition of much of the CSG Field is relatively poor in terms of fauna habitat, with evidence of frequent and hot fires, environmental weeds and grazing pressure in many areas. As such, the project may be able to contribute to better environmental outcomes via a number of means. These include:

- The development of a better road network will provide enhanced opportunities for fire control, particularly if prescribed fuel reduction burns are conducted along these roads to widen the fire barrier. The development of fire barriers also provides a safe haven for vehicles and personnel in the event of wildfires. The formulation of a fire management plan will also be important in order to provide for the protection of infrastructure.
- A reduction in fire frequency will allow the regeneration of ground storey vegetation and accumulation of leaf litter. This will supply vital habitats for many fauna species and provide protection from introduced predators.
- **Section 7** recommends offset initiatives where impacts to native vegetation and fauna habitats are unavoidable. These areas will be managed with a strong conservation focus and provide vital protection for flora and fauna in this region where other protected areas (Conservation Parks and National Parks) are absent. It is proposed that such areas will have conservation plans developed for them and active conservation management will be undertaken. This would include flora and fauna monitoring to assess the efficacy of conservation practices and to feedback into the development of improved future practices.
- Conservation focussed land management on QCG owned land including development of Conservation Plans and assessment of ecological implications of reducing grazing intensities and/or livestock exclusion.

6.5.9 *Summary of Potential Impacts on EPBC Act Listed Fauna*

Table 8 lists the EPBC listed fauna species that may potentially be impacted by the project and provides an assessment of the potential for significant impacts in accordance with the EPBC Significant Impact Guidelines, Policy Statement 1.1 (DEWHA 2006).

The potential impacts on EPBC Act Listed fauna is projected to be low, for with the application of the ecological constraints zoning model which is set out in Section 7, only small areas of vegetation are likely to be affected by the proposed CSG Field activities.

It is considered that the project could bring potential benefits to EPBC Act Listed fauna species. These have been discussed in **Section 6.5.8** above. The mapping of areas of high conservation value areas may be used to target key EPBC Act Listed fauna habitats with conservation management initiatives.

6.5.10 Impacts on Migratory and Marine Species

In addition to threatened species, the EPBC Act lists Migratory and Marine fauna, of which 12 species were identified by desktop studies. Of these species, during the field surveys the White-throated Needletail and the Fork-tailed Swift were observed within the CSG Field and the Magpie Goose was observed just outside the CSG at Lake Broadwater. These bird species occur fleetingly in the CSG Field or utilise the airspace above (swifts). For these species, an assessment was made as to whether the project was likely to:

- lead to loss or modification of habitat important for migratory species (including fragmentation, altered land use, fire regimes, altered nutrient cycle, altered hydrological cycles etc),
- introduce or establish invasive species, and
- disrupt species lifecycle (breeding, feeding, migration, roosting etc).

As discussed in the previous assessment, the level of disturbance proposed to native vegetation and other resources used by fauna is projected to be negligible, and so for migratory and marine species, impacts are projected to be even less. Many of the migratory/marine species are water birds and as outlined in **Section 7**, riparian and wetland habitats are afforded special protection in this project with most of these habitats precluded from any development.

Table 7 Potential for EPBC Act Listed Fauna Species to be Impacted

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
Fish						
Murray Cod	*Maccullochella peelii peelii*	VU	May occur in the Condamine River. Current environmental practices ensure that the river and its environs are fully protected.	Low	Condamine River environs excluded from development apart from some necessary easements placed with minimal disturbance	Low
Reptiles						
Five-clawed Worm Skink	*Anomalopus mackayi*	VU	Poorly known species in the area. Known from roadside grassy verges in disturbed habitats in the Dalby region. Not recorded in field surveys.	Low	Minimal clearing in native grasslands and grassy woodlands where species is likely to occur. Site clearances.	Low
Grassland Earless Dragon	*Tympanocryptus pinguicolla*	EN	Restricted to the black soil grasslands found primarily to the east of the CSG Field. Has demonstrated a capacity to adapt to high levels of disturbance in cultivated areas and pastures.	Low	Minimal clearing in native grasslands and grassy woodlands where species is likely to occur. Site clearances.	Low
Brigalow Scaly-foot	*Paradelma orientalis*	VU	The species distribution and habitat preferences are poorly known. It may occur in the northern portion of the CSG Field area. Not recorded in field surveys.	Low	Planning and Pre-clearance Surveys in areas of native vegetation	Low
Dunmall's Snake	*Furina dunmalli*	VU	No baseline data on populations in the area. Normally found in seasonal swampy areas in black soil.	Low	Planning and Clearance Surveys in areas of native vegetation. Primary habitat excluded from development.	Low
Yakka Skink	*Egernia rugosa*	VU	Distributed patchily from near Cairns to the Gold Coast. Often in dry	Low	Planning and Clearance Surveys	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
			sclerophyll forest. Occurrence in the CSG Field unknown. Not recorded in field surveys.			
Birds						
Red Goshawk	*Erythrotriorchis radiatus*	VU	This species requires extensive areas of intact forest habitat and in such areas, only occurs in low numbers. Not known from the QGC Fields. Records from the Dalby area are doubtful.	Low	Retention of existing large tracts of native vegetation.	Low
Squatter Pigeon (southern)	*Geophaps scripta scripta*	VU	The project area is in the southern part of the species' distributional range. Not recorded during field surveys. It is found in sandy areas adjacent permanent water.	Low	Planning and minimal clearing in forested habitats including riparian areas as per constraints mapping.	Low
White-bellied Sea Eagle	*Haliaeetus leucogaster*	Mi, Ma	In inland areas, this species is associated with extensive bodies of permanent water, none of which exist in the CSG Field. A possible vagrant along the Condamine River.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River. Primary habitat excluded from development.	Low
White-throated Needletail	*Hirundapus caudacutus*	Mi	A seasonal vagrant that forages well above the tree canopy in the CSG Field areas. Not known to roost or breed in Australia.	Low	Planning and minimal clearing in forested habitats including riparian areas.	Low
Rainbow Bee-eater	*Merops ornatus*	Mi	Seasonal visitor to the CSG Field area and possibly breeds in sandy creek banks and riparian dunes.	Low	Protection of riparian habitats.	Low
Rufous Fantail	*Rhipidura rufifrons*	Mi	Common species in more densely vegetated habitats. Broad distribution.	Low	Planning and minimal clearing in vine forest and forest habitats.	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
Great Egret	*Ardea alba*	Mi, Ma	Widespread species over much of the continent. No breeding records exist from the CSG Field area and it may possibly use ephemeral pondages and marshes in the area including the environs of the Condamine River.	Low	Protection of riparian habitats.	Low
Cattle Egret	*Ardea ibis*	Mi, Ma	Widespread and recorded from grasslands in the CSG Field although not known to breed there. Often feeds in association with domestic stock.	Low	Planning and minimal clearance of vegetation.	Low
Lathams Snipe	*Gallinago hardwickii*	Mi, Ma	Winter visitor to southern Australia where it is not known to breed. Commonly found in wetlands and adjacent grasslands.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Australian Cotton Pygmy-goose	*Nettapus coromandelianus albipennis*	Mi	Found in coastal central Queensland. The CSG Field are in the extreme south west of the species distributional range. Often found on water bodies with floating vegetation.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Painted Snipe	*Rostratula benghalensis*	Mi	Possibly a visitor to the CSG Field area in winter. Found in wetland areas.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Fork-tailed Swift	*Apus pacificus*	Mi, Ma	Summer migrant to Australia. Aerial forager and not strongly associated with any specific habitat type in the CSG Field.	Low	Planning and minimal clearance of vegetation.	Low
Magpie Goose	*Anseranus semipalmata*	Ma	A northern Australian species with very occasional representation as far south as Brisbane. Not recorded from	Low	Protection of riparian areas, swamps and marshes, including the	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
			the CSG Field area but likely to be a vagrant in wetland areas		immediate environs of the Condamine River.	
Swift Parrot	*Lathamus discolour*	EN	Impact restricted to feeding habitat, and this would be exceedingly minor, due to the very small percentage of native woodland or forest that might be altered.	Low	Minimal clearance of woodlands and forest areas where possible.	Low
Star Finch	*Neochima ruficauda ruficauda*	EN	Since 1900, few records have come from south of Townsville. If present in the area, it is most likely to be found in Eucalypt riparian areas along rivers.	Low	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Regent Honeyeater	*Anthochaera Phrygia*	EN, Mi	As for Swift Parrot. Not recorded from the CSG Field areas. In 2008, breeding was recorded in Durakai SF near Warwick.	Low	Minimal clearing in forested habitats including riparian areas	Low
Paradise Parrot	*Psephotus pulcherrimus*	EX	No records. No longer considered to occur in the area.	Nil	N/A	Nil
Australian Painted Snipe	*Rostratula australis*	VU	Widespread in eastern Australia. Not recorded in the CSG Field although it may occur in seasonal wetlands.	Moderate	Protection of riparian areas, swamps and marshes, including the immediate environs of the Condamine River.	Low
Plains-wanderer	*Pedionomus torquatus*	VU	Not recorded in the area.	Nil	N/A	Nil
Black-breasted Button-quail	*Turnix melanogaster*	VU	Dry vine forest is a primary habitat for this species and is exceedingly scarce in CSG Field.	Low	Planning and clearance surveys	Low
Mammals						
Eastern Long-eared Bat	*Nyctophilus timoriensis*	VU	Most commonly found in central western NSW and recorded in Qld in the Inglewood area. Occurs sparsely	Moderate	Minimal clearing in forested habitats including riparian areas	Low

Common Name	Scientific Name	EPBC	Assessment	Potential to be Impacted Without Mitigation Measures	Mitigation Measures	Potential to be Significantly Impacted with Mitigation Measures
			in a wide variety of habitats.			
Large-eared Pied Bat	*Chalinolobus dwyeri*	VU	Widely distributed but uncommon species known from mines and caves but is also a tree dweller. Major populations occur in proximity to sandstone and other rocky formations which presumably, are important roosts. Unlikely to occur in significant numbers in the CSG Field.	Low	Planning and minimal clearing in forested habitats including riparian areas	Low

***Status:** Commonwealth (EPBC) listed: **EX** = Extinct; **CE** = Critically Endangered; **EN** = Endangered; **VU** = Vulnerable; **Mi** = Migratory Species, **Ma** = Marine Species.

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6.6 Potential Impacts on Aquatic Fauna

Aquatic environments in the CSG Field are small in extent and will generally be excluded from any development. In some instances, linear features such as small creeks may need to be crossed in order to connect adjacent infrastructure. In these cases, the mitigation measures described in **Section 7** will substantially control the potential impacts associated with these construction activities.

As with other taxa groups, if the offsets recommendation is adopted, then aquatic habitats may benefit by extra protection through this process.

6.7 Potential Impacts on Wetlands

The internationally recognised wetland downstream of the CSG Field (via the Condamine River) is the Ramsar-listed Narran Lake Nature Reserve. As it is approximately 450 km southwest of the CSG Field, it is considered that there is a low potential that the proposed activities will impact this wetland.

No major wetlands occur within the CSG Field. Two occur immediately outside the CSG Field, Lake Broadwater Conservation Park and Resources Reserve and The Gums Lagoon. Lake Broadwater Conservation Park and Resources Reserve is downstream of Broadwater gully that is situated within the CSG Field (EPP 648). Consequently without appropriate mitigation measures, there would be potential for some impacts by nutrient and sediment flows and accidental releases of Associated Water. Gums Lagoon is not downstream of the CSG Field. Therefore, this wetland is not expected to be directly or indirectly impacted by the proposed developments.

6.8 Potential Impacts on Environmentally Sensitive Areas

Environmentally Sensitive Areas are described in **Section 5.4** and shown in **Figure A.20 [QC02-T-MA-0021]**.

The previous discussions on potential impacts to flora and fauna values apply equally to the Environmentally Sensitive Areas. To avoid repetition, these potential impacts are not repeated here.

In the absence of appropriate mitigation measures there could be potential for Environmentally Sensitive Areas within the CSG Field to be significantly impacted by the proposed developments. In order to mitigate these impacts, **Section 7** recommends a constraint based approach to development within the CSG Field which includes identification of constraints areas through the analysis and mapping of overall conservation values. This approach then facilitates the development of a zoning system so that more stringent environmental conditions can be applied to areas of high conservation value Through the use of this zoning system it is anticipated that potential impacts to key habitats and taxa will be minimal.

Assuming the successful adoption and implementation of the mitigation and rehabilitation recommendations outlined in **Section 7**, the potential for the Project to have significant impacts on Environmentally Sensitive Areas is low. There is potential for the project to contribute to protecting and improving environmental values in these areas through conservation focussed offsets and land management initiatives.

7.0 MITIGATION AND REHABILITATION RECOMMENDATIONS

7.1 Constraints Based Approach to Managing Impacts

The synthesis of all conservation values identified from EPA data, specific field survey work and other sources as identified previously in this report, has enabled the development of mapping that indicates the overall conservation values for areas across the QGC Field. This mapping is presented as the Environmentally Sensitive Areas shown in **Figure A.20 [QC02-T-MA-0021]**.

This Environmentally Sensitive Areas mapping has then been used as a basis to develop an Ecological Constraints zoning system which places more stringent environmental conditions on areas of high conservation value and less stringent conditions where conservation values are lower (**Figure A.21 [QC02-T-MA-0040]**).

The mapping is primarily based on RE polygons and tenure considerations. In order to translate this into workable constraints zones for field operations, the mapping has been simplified and four constraints zones have been recommended. They are:

- Zone 1 Minimal Ecological Constraints
- Zone 2 Medium Ecological Constraints
- Zone 3 High Ecological Constraints, and
- Zone 4 Very High Ecological Constraints.

The guidelines below are presented as:

1. General recommendations that are applicable across the whole of the CSG Field, and
2. Special recommendations for each constraints zone.

In this way, it is anticipated that potential impacts to key habitats and taxa will be minimised.

7.2 General Recommendations

In addition to the protection measures which are already part of the existing Environmental Management Plan (e.g. weed washdowns, water disposal, audits) (**Attachment 3** of **Appendix 3.2**), the following mitigation measures are recommended to help ensure that significant impacts on biodiversity are avoided where possible and otherwise minimised:

- Infrastructure will be located away from remnant vegetation areas whenever possible. This includes roadside verges, travelling stock routes and similar areas that may have so far escaped clearing in otherwise cleared and developed areas
- The clearing or disturbance of all EPBC listed Ecological Communities will be avoided whenever possible
- An offset strategy which compensates for all unavoidable clearing will be developed and implemented (refer **Section 7.7**)
- Individual site pre-clearance surveys will be undertaken for each proposed road, well pad and pipeline (and other infrastructure), as is currently the practice, to enable detection and avoidance of flora and fauna values whenever possible, but should be expanded to include:

  - The presence or absence of EPBC Listed communities (including the Weeping Myall Open Woodland Community) and species
  - Identification of potential microhabitat for fauna (e.g. hollow-bearing trees) and fauna habitat which may require the presence of fauna handlers during clearing
  - Confirmation of results of the EVR flora field clearance searches and fauna microhabitat features
  - Compulsory answers/options providing a clear action path stemming from each answer
  - Identification of permitting requirements, and
  - Note the presence or absence of declared weed species in order to develop site-specific weed management options (control, vehicle and machinery washdowns).

- A clearing database will be maintained to record the areas of each RE cleared for CSG activities/infrastructure
- Good weed hygiene practices should be adopted to minimise the introduction or spread of declared, agricultural and environmental weeds in the CSG Field. These should include regular ongoing monitoring of areas disturbed by CSG activities
- Declared, agricultural and environmental weeds should be controlled throughout the construction, operational and decommissioning phases of the project. In relation to the construction footprint and areas of disturbance, it is recommended that environmental weeds, such as Buffel Grass (*Cenchrus ciliaris*), Castor Oil (*Ricinus communis*), Mexican Poppy (*Argemone ochroleuca*), Mimosa Bush (*Acacia farnesiana*) and Guinea Grass/Green Panic (*Megathyrsus maximus*) are also managed, particularly during the construction phase and subsequent rehabilitation works. Rehabilitation of disturbed areas may also benefit from control of other exotic grasses; however, landholders may request that these species are retained for grazing purposes
- A Weed Management Plan that addresses the construction, rehabilitation and operation phases of the project will be prepared prior to construction. This Plan will include hygiene protocols to minimise the likelihood of introduction and spread of environmental, agricultural and declared weeds
- Fauna handlers will be present to survey for, and as necessary relocate wildlife immediately prior to and during clearing activities in all locations identified as containing suitable fauna habitat during the pre-clearance surveys
- Fire fuel loads will be monitored and vehicle activities will be restricted to roads, access tracks and hardened surfaces to reduce the possibility of wildfire. Vehicles will be fitted with spark arrestors and fire fighting equipment will be available at construction sites
- Vegetated creeklines, fencelines and road reserves will be crossed at approximately 90 degrees whenever possible to limit the extent of clearing
- Measures will be taken to avoid placing water storage facilities in the Lake Broadwater catchment area (Broadwater Gully) which occurs in the south eastern corner of EPP 648. This may help reduce the potential for nutrient,

sediment and Associated Water (accidently released) flows entering Lake Broadwater Conservation Park.

- The EMP will include appropriate requirements in relation to management of waste and potential contaminants, and
- Conservation Plans will be developed and implemented. These plans will set out conservation focussed land management initiatives to be taken on QGC owned land.

7.3 Recommendations for Zone 1 Minimal Ecological Constraints

These areas are substantially altered habitats with existing pastures of predominantly non-native species, cropping lands, intensively grazed and rural-residential areas. Some unmapped remnant vegetation may occur along the margins of paddocks or in roadside reserves and may be of moderate to high conservation value but are relatively small in extent and managed in the overall context of the predominant land use of the area.

Since the majority of this zone is privately owned and managed for primary production, the wishes of the landholder will be a primary factor in determining the placement and management of infrastructure, subject to the general guidelines above (**Section 7.2**) as they relate to least concern flora and fauna, EPBC Act Listed species, Ecological Communities / REs and weeds.

Final rehabilitation requirements for sites in this zone will be negotiated with the landowner. In most cases they would provide for the return of areas to productive agricultural land.

7.4 Recommendations for Zone 2 Medium Ecological Constraints

Zone 2 areas include all mapped remnant vegetation (with the exception of Zone 3 and 4 areas). In addition to the General Guidelines, the following mitigation measures have been adopted for Zone 2 areas. :

- Infrastructure and access lines will be located along existing easements where possible
- Fauna handlers will be present to survey for, and as necessary relocate wildlife immediately prior to and during clearing activities in all locations identified as containing suitable fauna habitat during the pre-clearance surveys
- Vegetative waste as a result of clearing will be mulched or distributed across adjacent areas where it may provide refuge for terrestrial species. It will not be burnt, and
- Linear features such as roads and pipelines will be built to a standard sufficient to allow for their intended purpose but should be allowed to revegetate as much as possible in order to minimise their impact on terrestrial fauna movements.

7.4.1 Rehabilitation Requirements

Rehabilitation will be negotiated with the landholder where applicable. Unless roads and pads are to be retained for other use, areas will be ripped and allowed to naturally revegetate. Hardened road surfaces will be removed or regraded to restore the original land surface as much as possible.

A re-seeding plan will be developed based on soil types, existing local vegetation characteristics and landholder preferences along the alignment. If available (and subject to landholder preferences), local provenance native seed will be used for

regeneration seeding following construction in all disturbed areas. If local provenance seed cannot be collected or purchased, native grass seed from other parts of central Queensland will be purchased from commercial operators and re-spread in these locations.

Monitoring and control of weeds will be conducted on an ongoing basis during the life of the Project. A Weed Management Plan that addresses the construction, rehabilitation and operation phases of the project will be prepared prior to construction. This Plan will include hygiene protocols to minimise the likelihood of introduction and spread of environmental, agricultural and declared weeds.

Rehabilitation should be monitored on a monthly basis for six months after works are completed and then bi-annually for two years.

7.5 Recommendations for Zone 3 High Ecological Constraints

Zone 3 areas are all the State Forests within the CSG Field, with the exception of Gurulmundi State Forest, namely:

- Hinchley State Forest
- Mount Organ State Forest
- Cherwondah State Forest
- Condamine State Forest
- Braemer State Forest
- Vickery State Forest
- Daandine State Forest
- Weranga State Forest, and
- Kumbarilla State Forest.

State Forests were selected as High Ecological Constraints areas because they contain the vast majority of the mapped REs of high conservation value including areas of significant value to EVR flora and fauna, refugial areas and areas critically important to the maintenance of existing biodiversity values.

For High Ecological Constraints areas, the following recommendations are made in addition to those identified in **Sections 7.2-7.4**:

- All CSG Activities to be planned and undertaken in close liaison with EPA State Forest Management staff
- Where possible, site access to be only along existing cleared tracks, fire trails and easements. Where this is not possible, access is to be negotiated with EPA State Forest management staff.
- EPA and/or independent flora and fauna consultants to be involved in detailed pre-clearance surveys as part of early planning for infrastructure locations
- In order to minimise fragmentation effects pads for gas extraction will be of minimum safe area and placed against the edge of existing easements where possible
- Use of “Best Available Technology” to minimise clearing requirements.
- Access tracks will be incorporated into pad clearance areas where possible to minimise total clearing requirements.

- Extraction methodologies that minimise the density of well pads in these areas (e.g. horizontal drilling) will be investigated and used where practicable
- Vehicles and machinery will require washdown before entering State Forest, if they have come from Zone 1 areas or known weed areas. The control of Buffel grass is a key consideration in this zone, and
- Access tracks will be regularly inspected for weeds and control measures employed where serious environmental or declared weeds are identified. It is recognised that some weed species may have established in areas pre-project commencement, and so less emphasis will be placed on these. The primary object of the guideline is to control weed spread that may occur as a direct result of the project.

7.5.1 Rehabilitation Requirements

Rehabilitation will be managed in close liaison with the landholder (EPA) and involve the restoration of sites to a level that is mutually acceptable to the parties, the overall goal being the maintenance of biological processes and conservation of natural systems.

7.6 Recommendations for Zone 4 Very High Ecological Constraints

Zone 4a and 4b included areas with the highest ecological values. These values could potentially be significantly impacted by the CSG activities. It is therefore recommended that all non-linear CSG infrastructure be excluded from these Zones. The construction of gathering systems and access tracks should follow the criteria in Zone 3 throughout the areas, with avoidance of new disturbance being the primary objective.

Zone 4a areas are considered to have higher conservation values than Zone 4b. They are distinguished from each other only for the purpose of enabling planning of linear infrastructure to avoid Zone 4a areas in preference to Zone 4b areas in locations where such areas are unavoidable.

Areas within Zone 4a include:

- Gurulmundi State Forest and the Environmentally Sensitive area immediately north west of the State Forest. The location of linear infrastructure (e.g. pipelines and access tracks) through this area will be determined by ecologist field studies at the detailed design stage to follow existing tracks and previously disturbed areas where possible and to avoid or minimise disturbance of highest value areas (e.g. EVR plant populations, high quality fauna habitats, steep terrain). QGC will not undertake drilling or development of non-linear infrastructure in this area prior to government endorsement of detailed development plans showing proposed production techniques and infrastructure locations. Such a plan would be based on detailed ecological investigations within this area and would aim at ensuring that any such development would be undertaken in an ecologically sustainable and acceptable manner.

- EPBC Act listed Ecological Communities, and
- The EPA defined Category B Environmentally Sensitive Areas which, in the CSG Field, include:
  - VM Act Endangered Res, and

- Additional REs classified as Endangered under the EPA's Biodiversity Status.

Areas within Zone 4b include:

- RE 11.3.27 (ephemeral wetlands), and
- Buffer zones adjacent to watercourses in accordance with the Environmental Authority conditions for QGC's existing operations, namely:
  - 50m from Stream Order 1 and 2 watercourses
  - 100m from Stream Order 3 and 4 watercourses, and
  - 200m from Stream Order 5-8 watercourses.

It is recognised that in a small number of instances linear infrastructure (e.g. collection lines, pipelines and access tracks) will be unable to avoid transecting linear remnants and watercourses of very high ecological value (i.e. Zone 4 a and b areas). Provided such unavoidable impacts are minimised and compensated for by offset initiatives the proposed activities will not have a significant impact on the conservation values of these areas.

7.7 Environmental Offsets and Conservation Focused Land Management

An environmental offsets strategy is expected to be developed prior to the commencement of the Project. That strategy will identify the environmental offset activities which will be established to compensate for all ecological impacts (e.g. loss of vegetation, fragmentation of fauna habitat and movement corridors, disturbance of EVR flora) where clearing and CSG extraction activities within areas of remnant vegetation areas are unavoidable. It is envisaged that there will be opportunities to undertake most offset activities within the Gas Field (as opposed to removed locations).

To the greatest practicable extent the offset activities will address both Commonwealth and Queensland Governments' offsets legislation and policy, including Part 9 of the EPBC Act (in particular s. 134 and 136), and the Queensland Government's Environmental Offsets Policy (QGEOP) (EPA 2008). As such, the offset activities will incorporate the following principles:

- Offsets should only be utilised in situations where impacts on environmental values are unavoidable.
- The offset must directly relate to the environmental value that will be impacted, often referred to as the "like for like" principle.
- The offset may be either direct or indirect actions. A direct action usually requires the on-ground maintenance and/or improvement of the protected matter. An indirect action, however, includes a wide range of actions that improve the knowledge and understanding of a protected matter in order to facilitate its conservation.
- The implementation of the offset must be timed to minimise the time lag between the impact and the delivery of the offset.
- Where possible the offset will be located in the vicinity of the impact.
- The offset must be legally secured
- Mechanisms will be put in place to ensure that the offset is enforceable, monitored and audited.

According to the QGEOP, an environmental offset is taken to be legally secured if protected by some form of legally binding mechanism. These can include:

- Designation as a protected area under the *Nature Conservation Act*
- Designation as an area of high nature conservation value under the *Vegetation Management Act*, and
- The purchase of land or the establishment of a covenant under the Land Title Act 1994 (EPA 2008d).

It is preferable that offsets are protected for the long term by purchasing land or establishing covenants on title (e.g. VM Act covenants). As such, selection of offset sites will also depend on a number of non-environmental factors including:

- land tenure – tenure needs to enable purchase or covenants on title
- landholder preferences – it will be necessary to find willing landholders to sell or covenant land
- land use – (e.g. alienation of GQAL constraints and possible synergies and constraints relating to CSG activities and other land uses)

It is recommended that the QC LNG Offset Strategy sets out a process to identify landholders within offset priority areas. In the first instance, sites should be identified on the basis of their conservation values and similarity to those areas likely to be impacted ("like for like").

Current government policy stipulates that a 'package' of offset actions is likely to lead to the better conservation outcomes. QC LNG should be in keeping with this best practice by considering a broad range of direct and indirect actions throughout the initial development stage of its Offsets Strategy.

Priority offset areas from an environmental perspective would include:

- Matters of National Environmental Significance
- EREs
- OC REs
- Any REs where clearing may be considered as a significant impact.
- Particular EVR fauna habitats
- EVR flora rich areas
- Connections/Corridors
- Riparian areas
- Areas containing wetlands and Marine Plant areas (REs 11.1.2, 11.1.4, 11.3.27)
- Areas linking/adjoining any of the above areas.

Flora assessments and detailed fauna surveys have noted the relatively degraded state of many environments in the Gas Field. The impacts identified include inappropriate fire regimes, environmental and declared weed invasions, feral animals and grazing pressure from stock.

Through its investment in the region, QGC will provide opportunities to manage some of these environmental issues and thus realise local environmental benefits. QGC has invested significantly in fencing and gates to control stock movements,

improved access tracks and increased personnel in the region, all of which assists in fire prevention and limits weed propagation. Areas dedicated as environmental offsets, would provide further opportunities for enhanced environmental management through the dedication of special purpose conservation areas and may improve the connectivity between these environments.

It is recommended that where offset areas are established, management and monitoring plans be developed in order to guide the strategic development of these areas, identifying key values, threats and the environmental management strategies required to achieve the appropriate conservation outcomes.

The environmental management of these areas should generally encompass:

- Fire management planning and activities (e.g. firebreak grading, fire mapping, fire response planning)
- Livestock exclusion (e.g. fencing)
- Weed control
- Feral animal control activities (e.g. fox and rabbit baiting), and
- Flora and fauna monitoring in order to assess implemented management strategies.

8.0 CONCLUSION

Provided that the recommended mitigation and rehabilitation measures are adopted and successfully implemented, the proposed CSG extraction activities will be unlikely to have a significant impact on any EPBC Act MNES.

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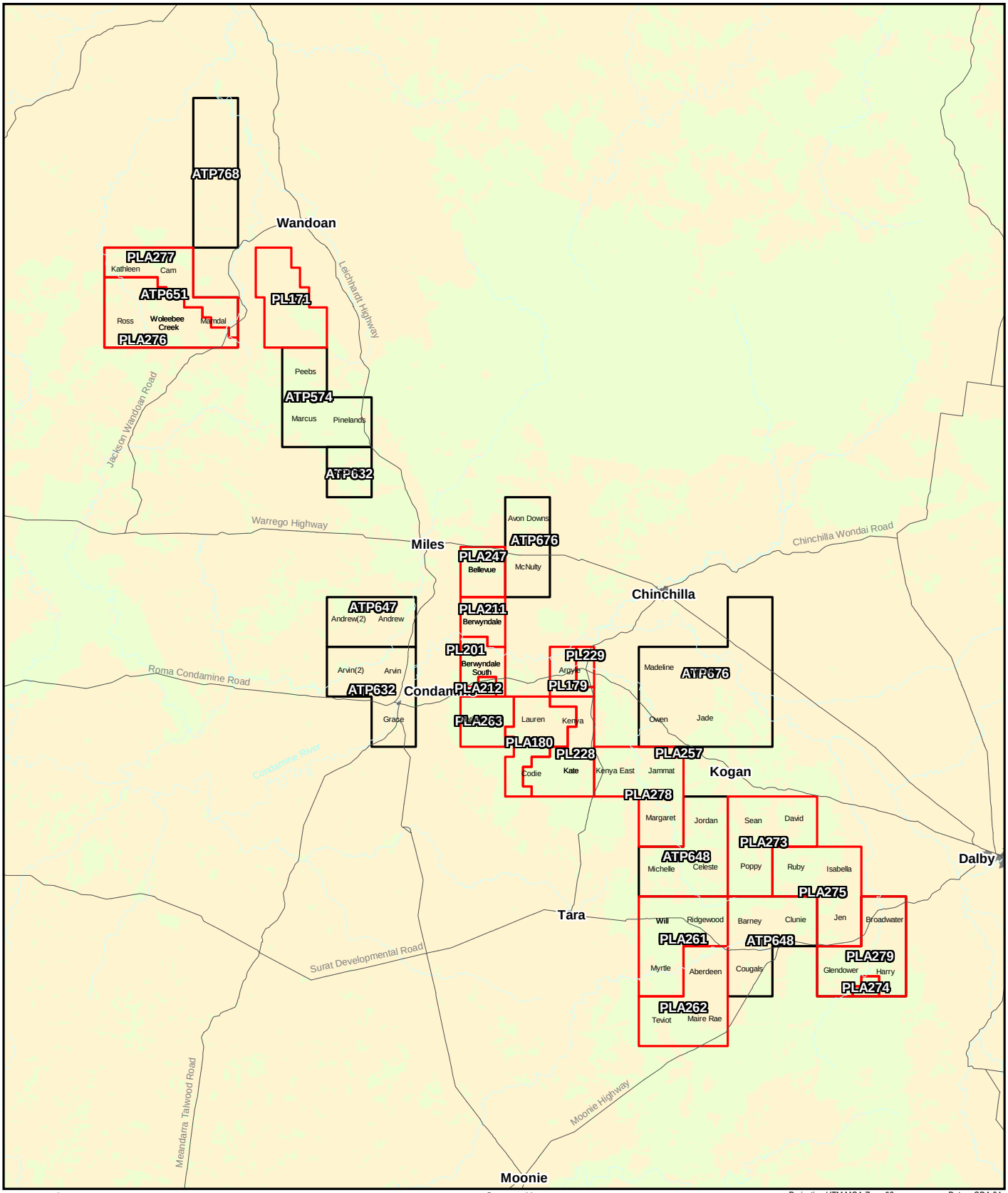

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A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Title	**Gas Field - Overview**

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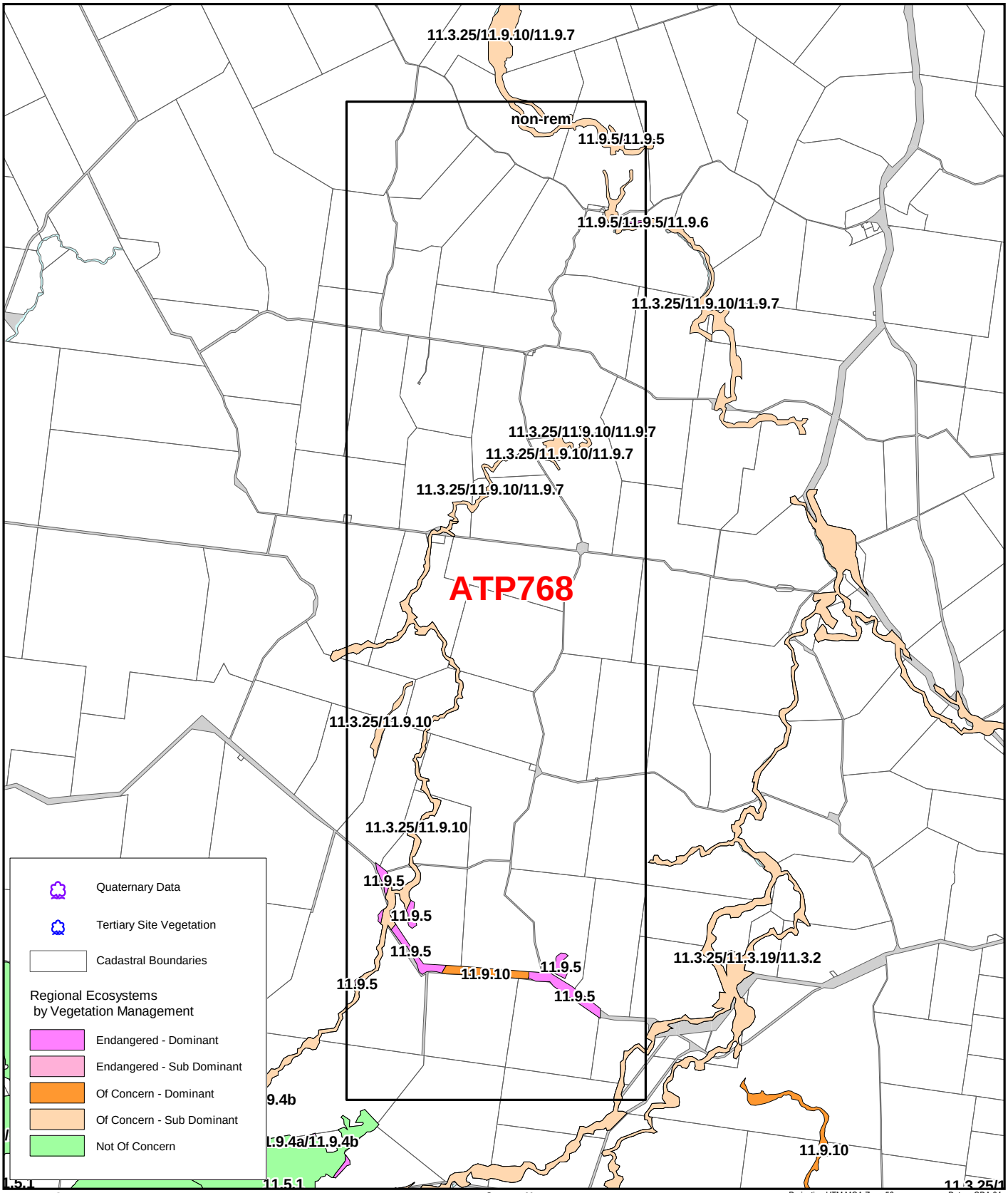

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	Client	QGC - A BG Group business	
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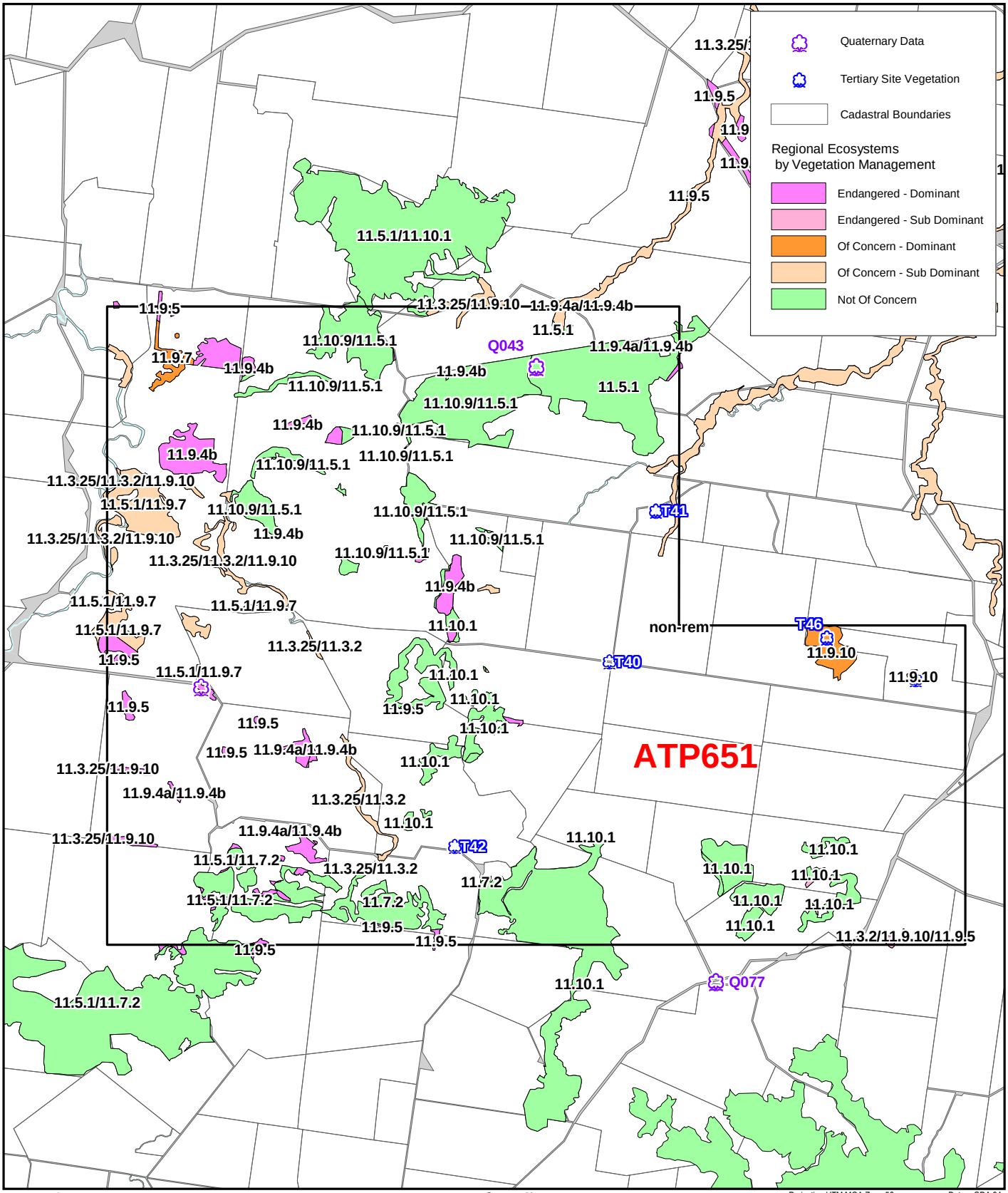

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	Client	QGC - A BG Group business	
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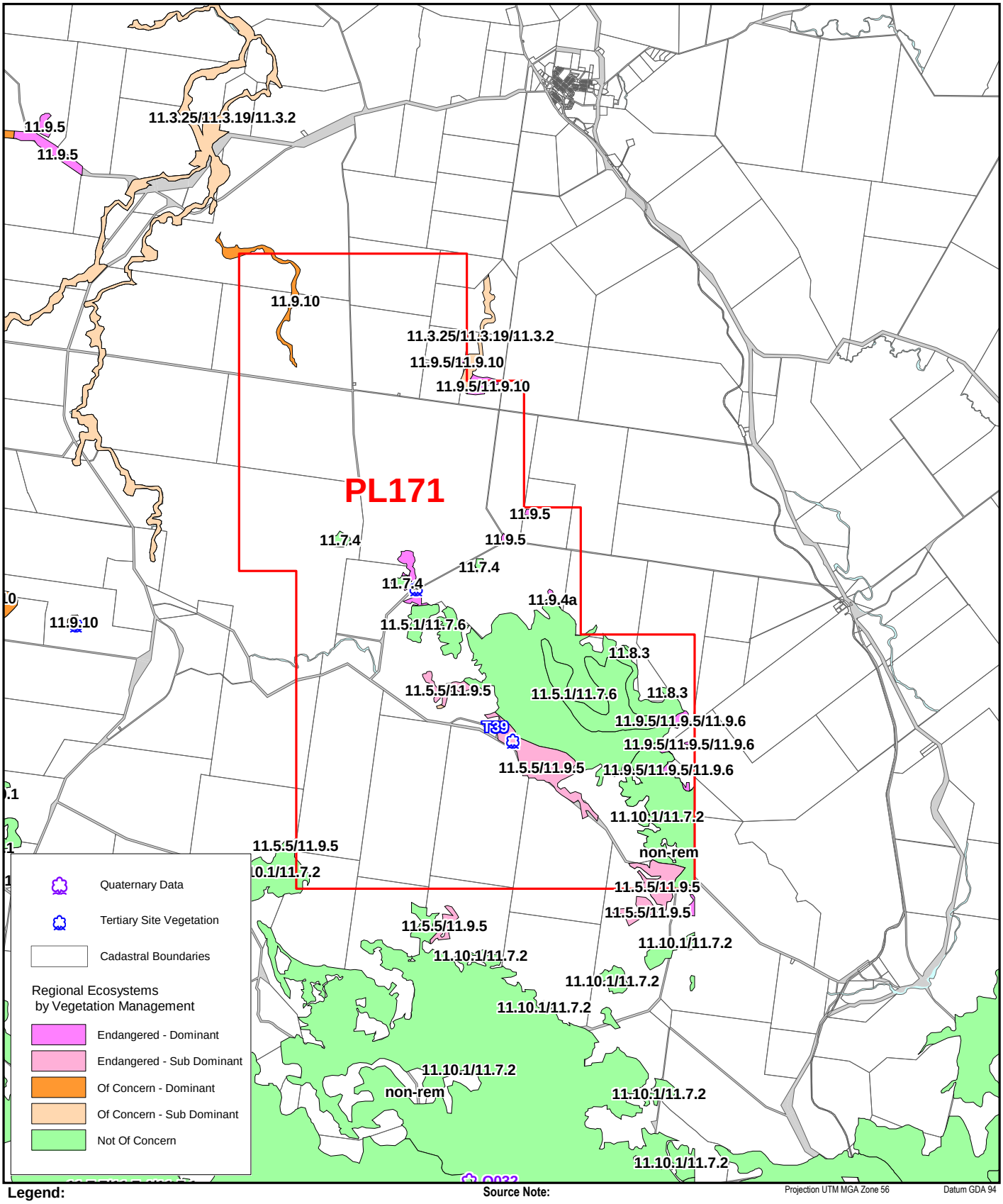

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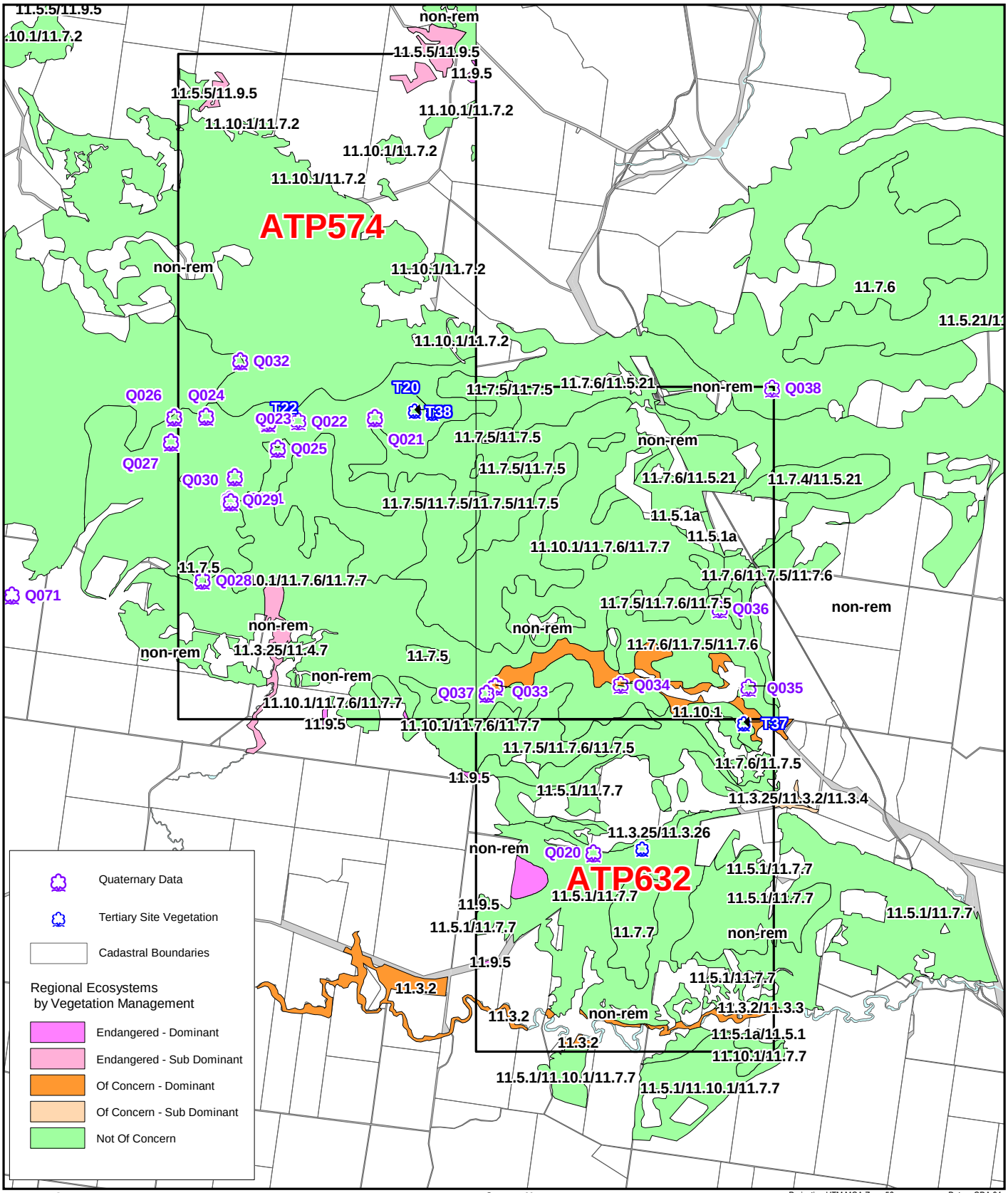

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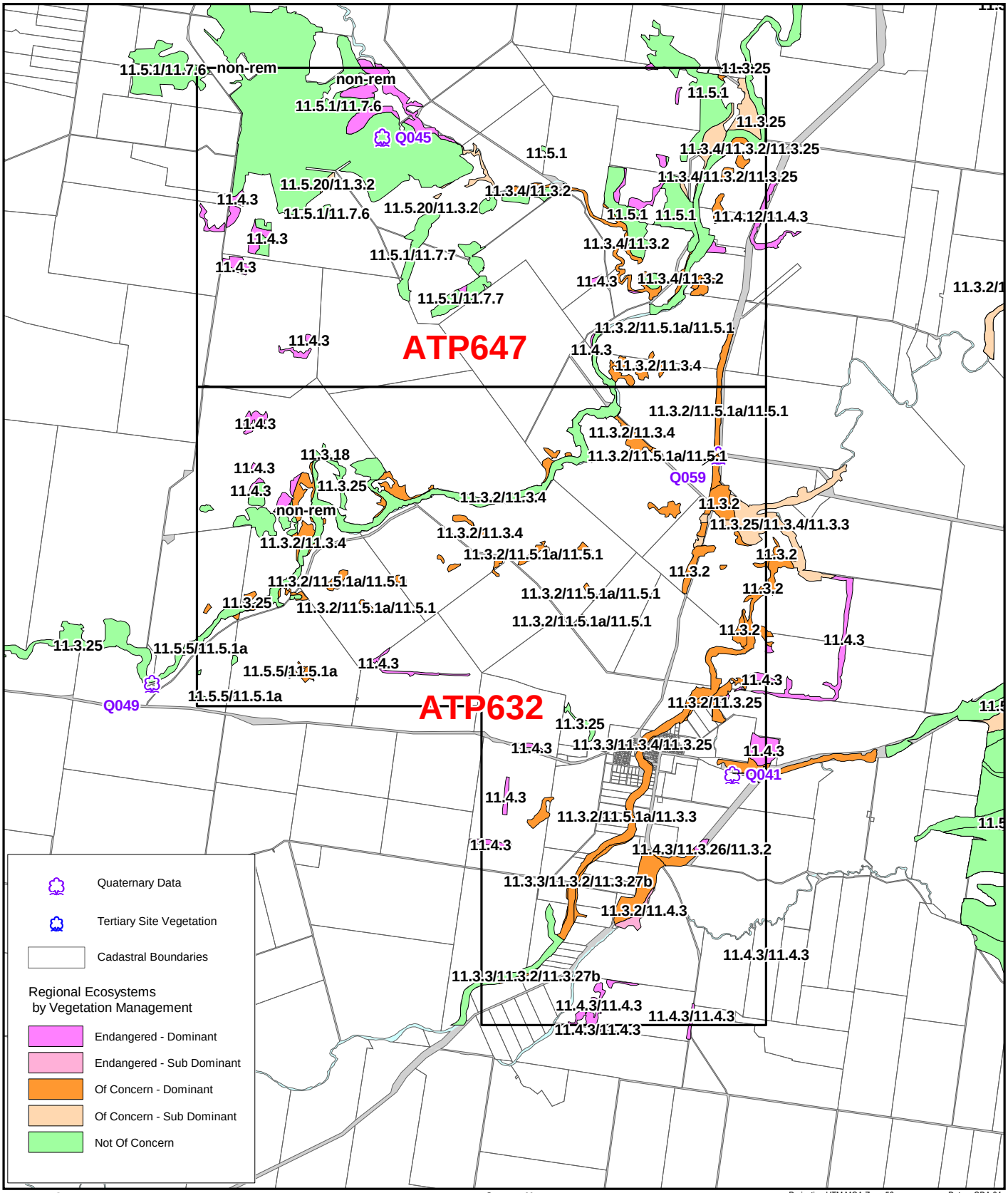

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Project	Queensland Curtis LNG Project	Title	Mapped RE's within Gas Fields - ATP647 & ATP632
Client	QGC - A BG Group business		
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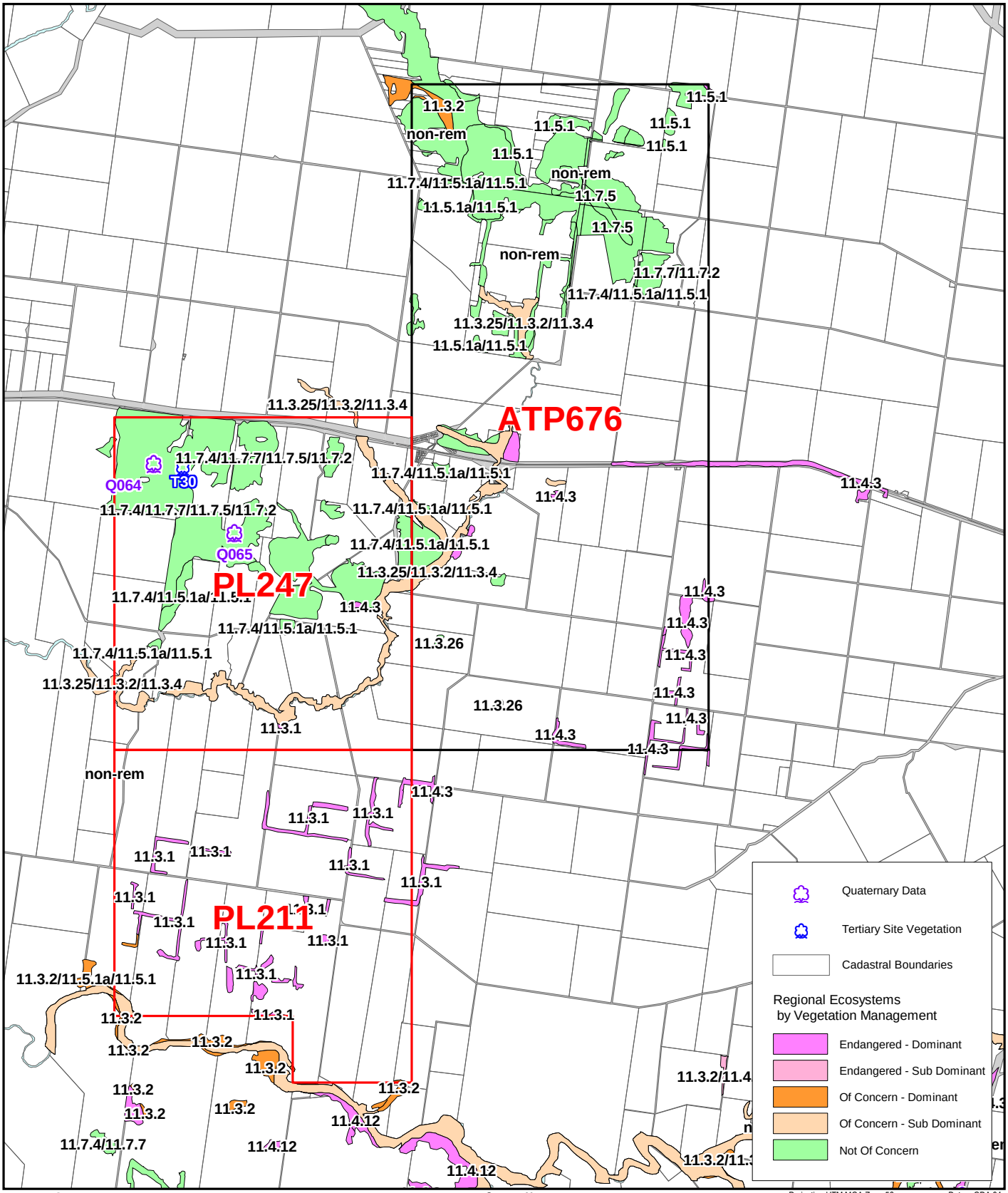

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Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within Gas Fields - ATP676, PL247 & PL211**

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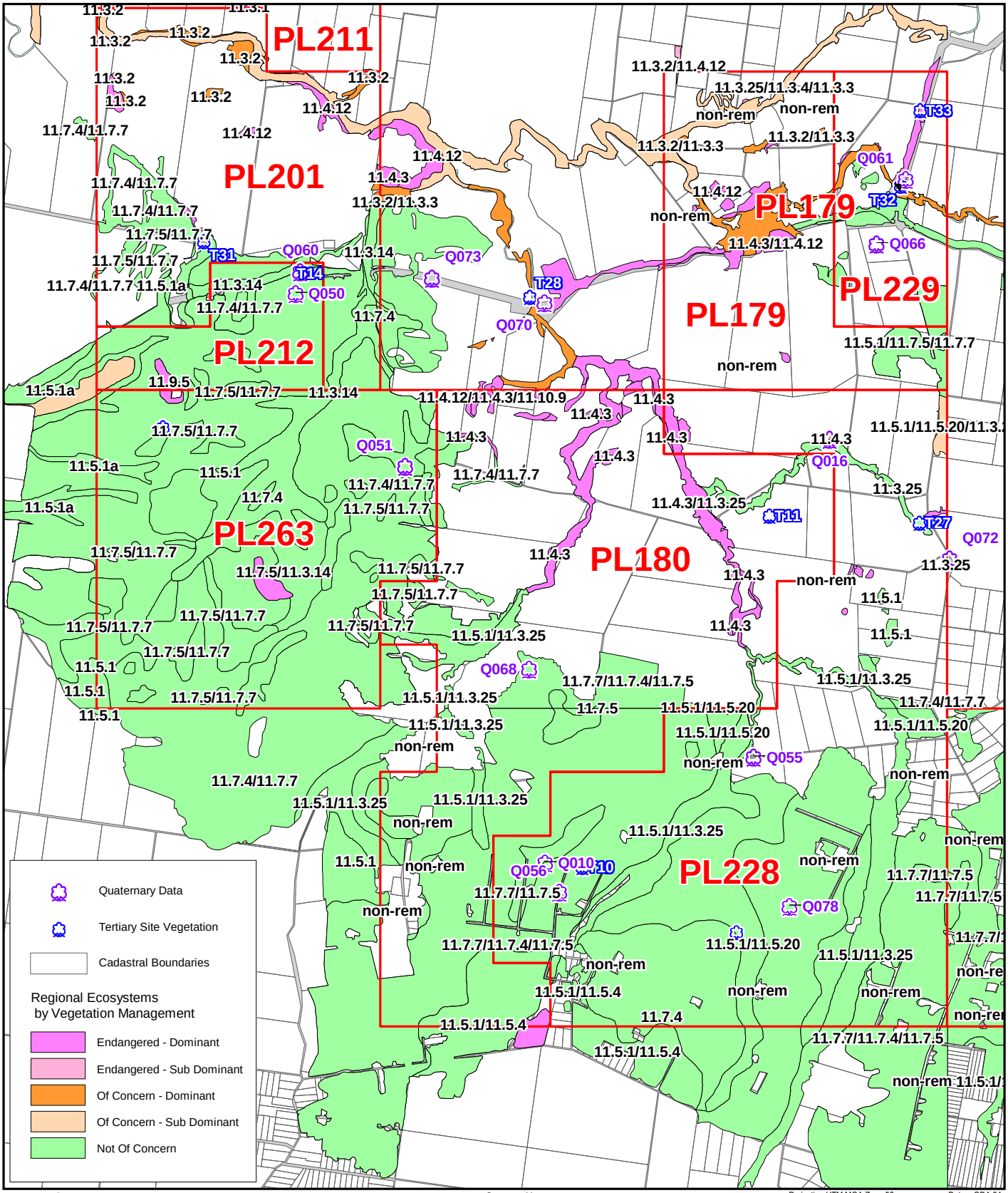

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Client	QGC - A BG Group business
Drawn	Mipela
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Title: **Mapped RE's within Gas Fields - PL201, PL212, PL263, PL180, PL179, PL229 & PL228**

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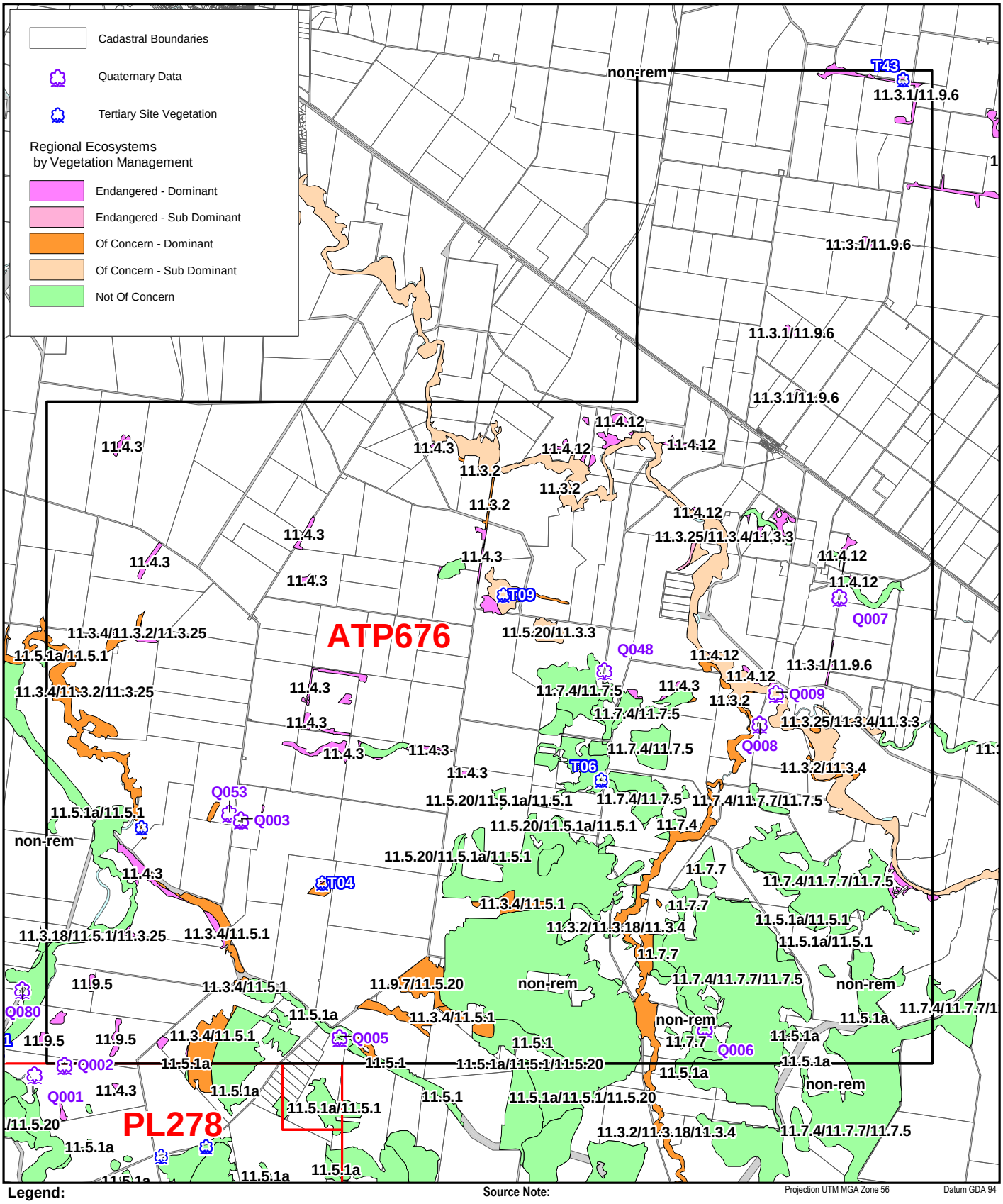

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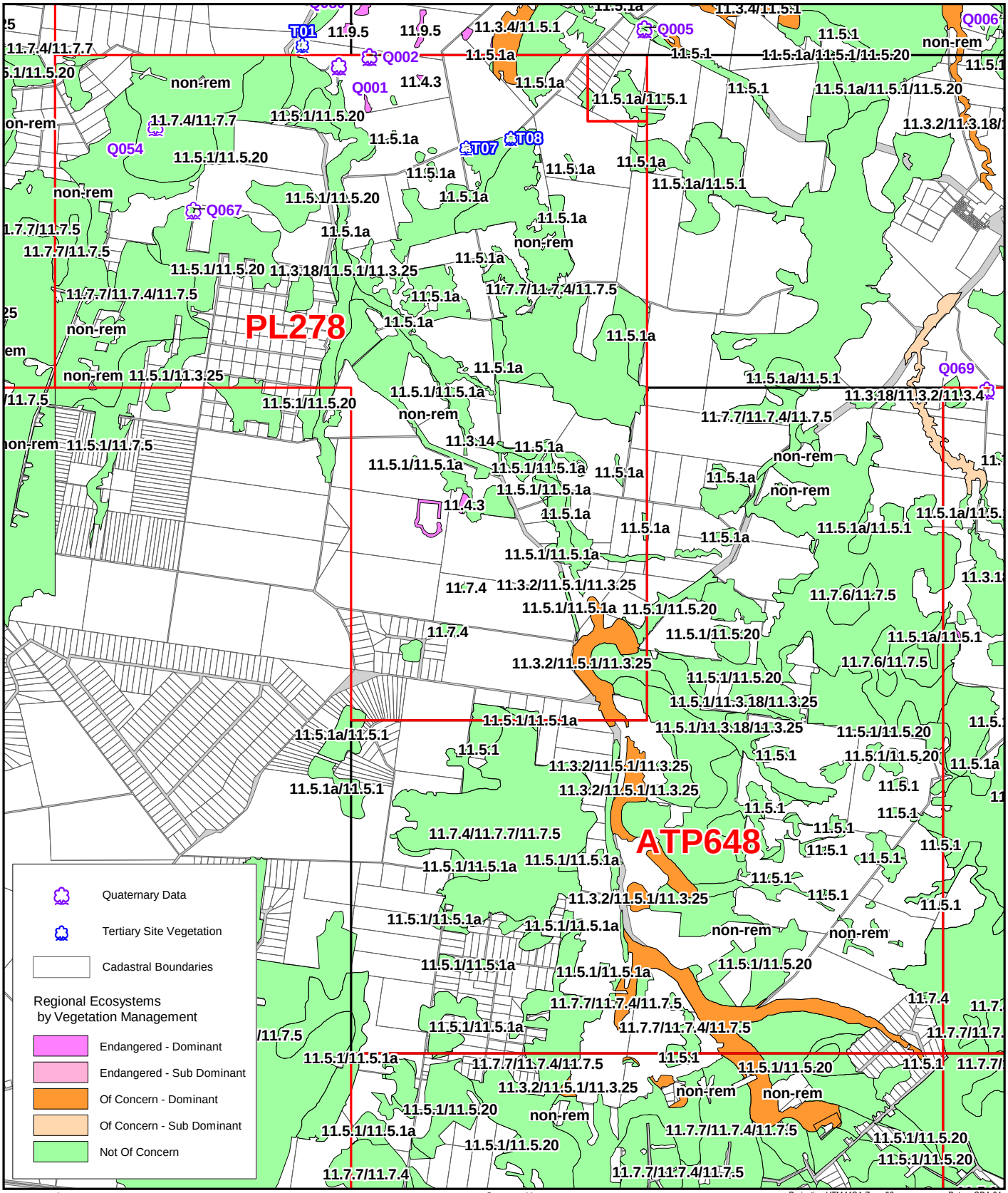

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A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within Gas Fields - ATP648 & PL278**

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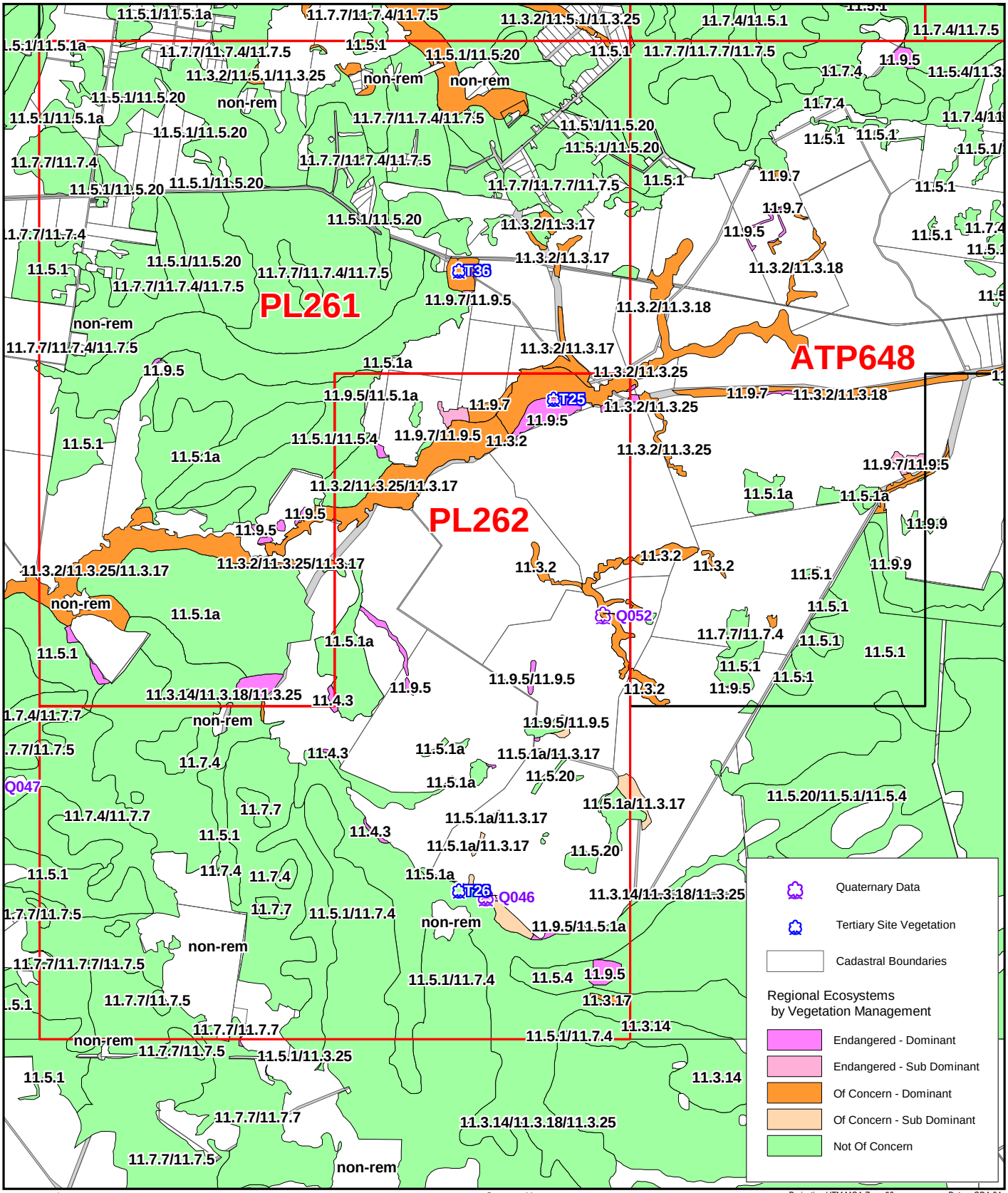

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Kilometres

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project	Title: **Mapped RE's within Gas Fields - ATP648, PL261 & PL262**	
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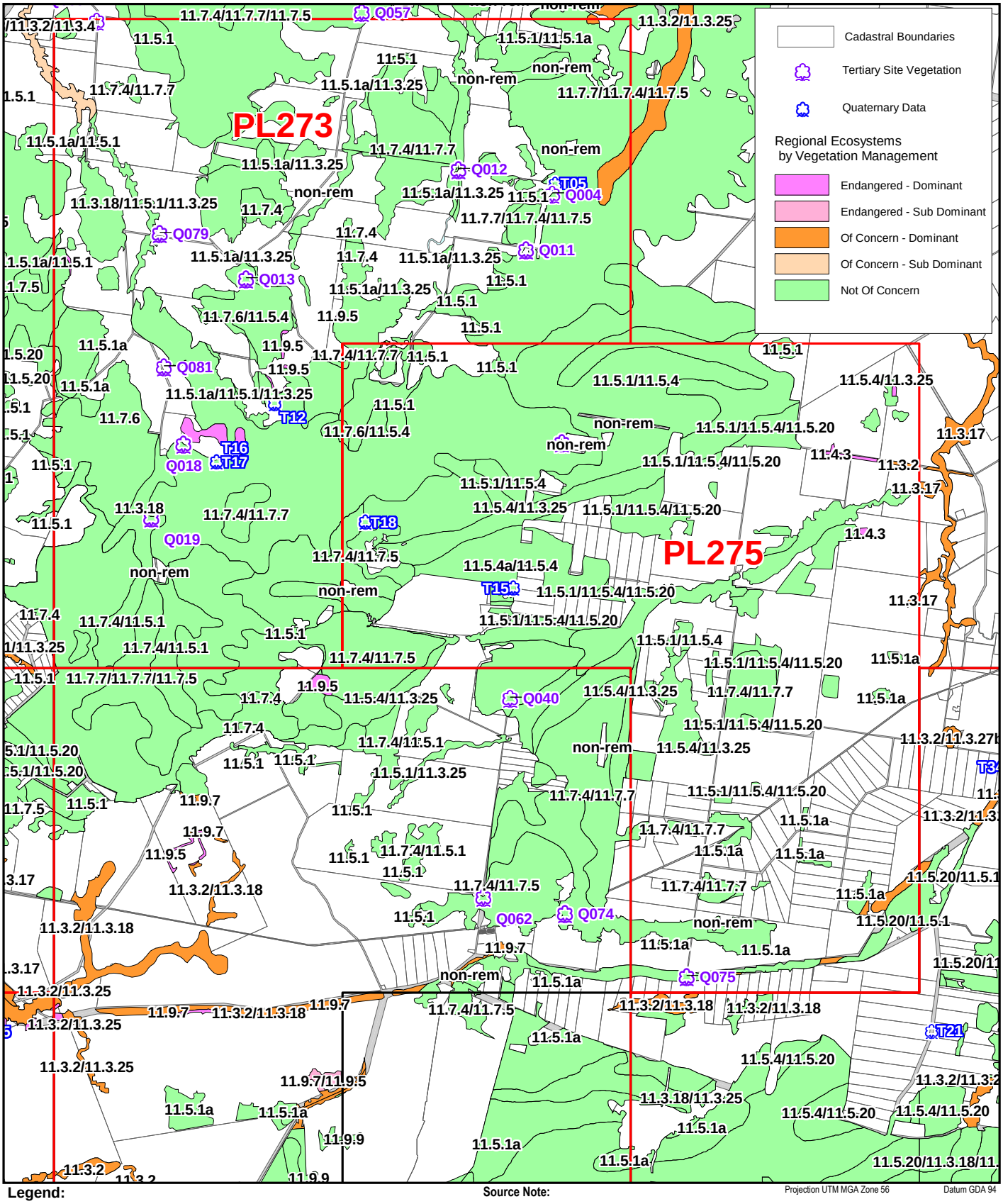

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project	Title: **Mapped RE's within Gas Fields - ATP648, PL259 & PL269**	
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	**Annex 13.1**	**Figure 13.12**
	Approved: CDP	File No: QC02-T-MA-00103	
	Date: 17.07.09	Revision: A	

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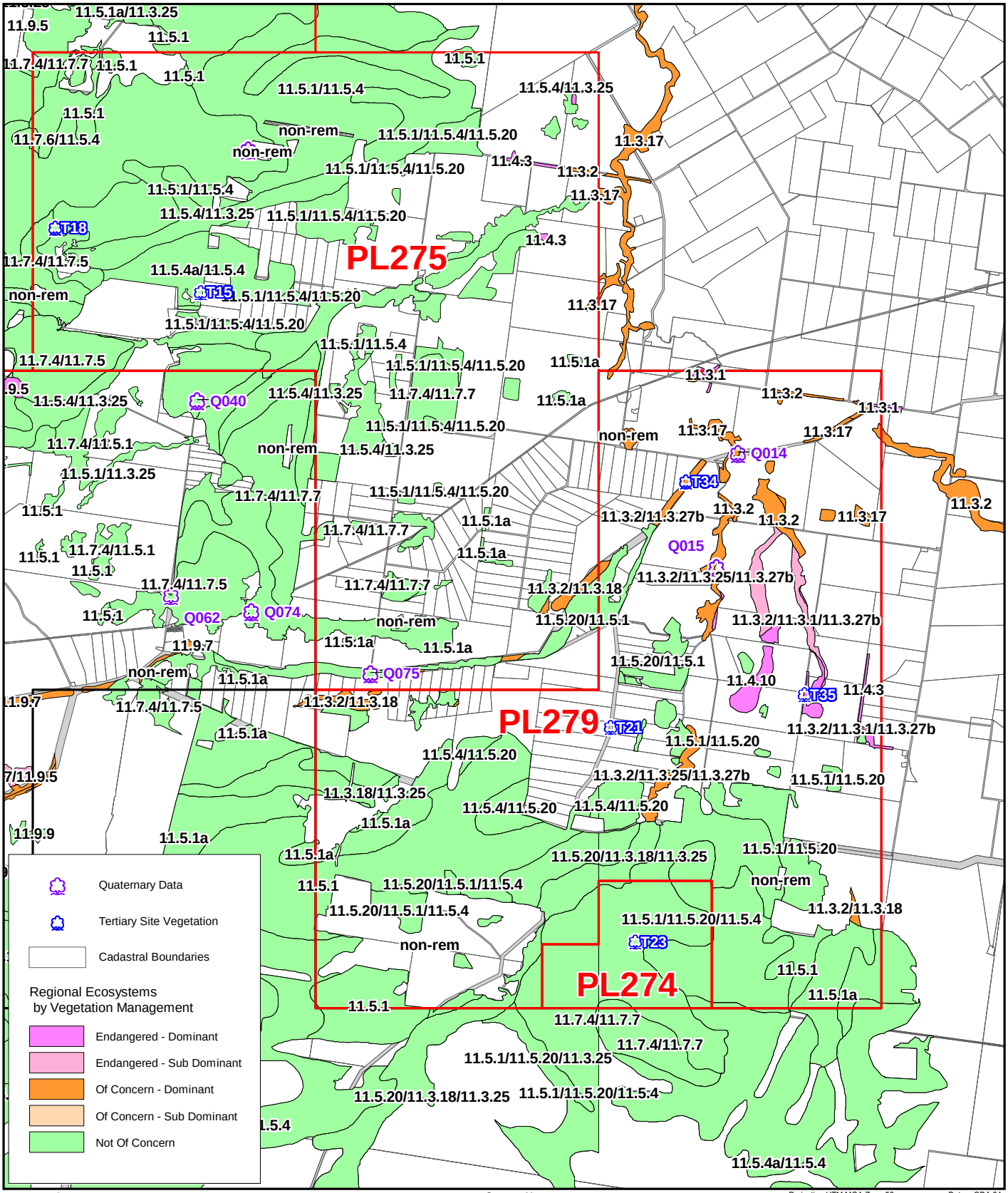

Legend:

Gas Fields - Petroleum Lease/Petroleum Lease Application

Gas Fields - Authority to Prospect

Source Note:

Regional Ecosystems v5.0 copyright Queensland Herbarium
DCDB data copyright State of Queensland (2008)
Quaternary and Tertiary Sites captured by Ann Moran using Trimble Nomad (+/-15m)

Projection UTM MGA Zone 56 Datum GDA 94

0 1.5 3 4.5 6

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Mapped RE's within Gas Fields - ATP648, PL274, PL275 & PL279**

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	Annex 13.1	Figure 13.13
Approved	CDP	File No:	QC02-T-MA-00104
Date	17.07.09	Revision	A

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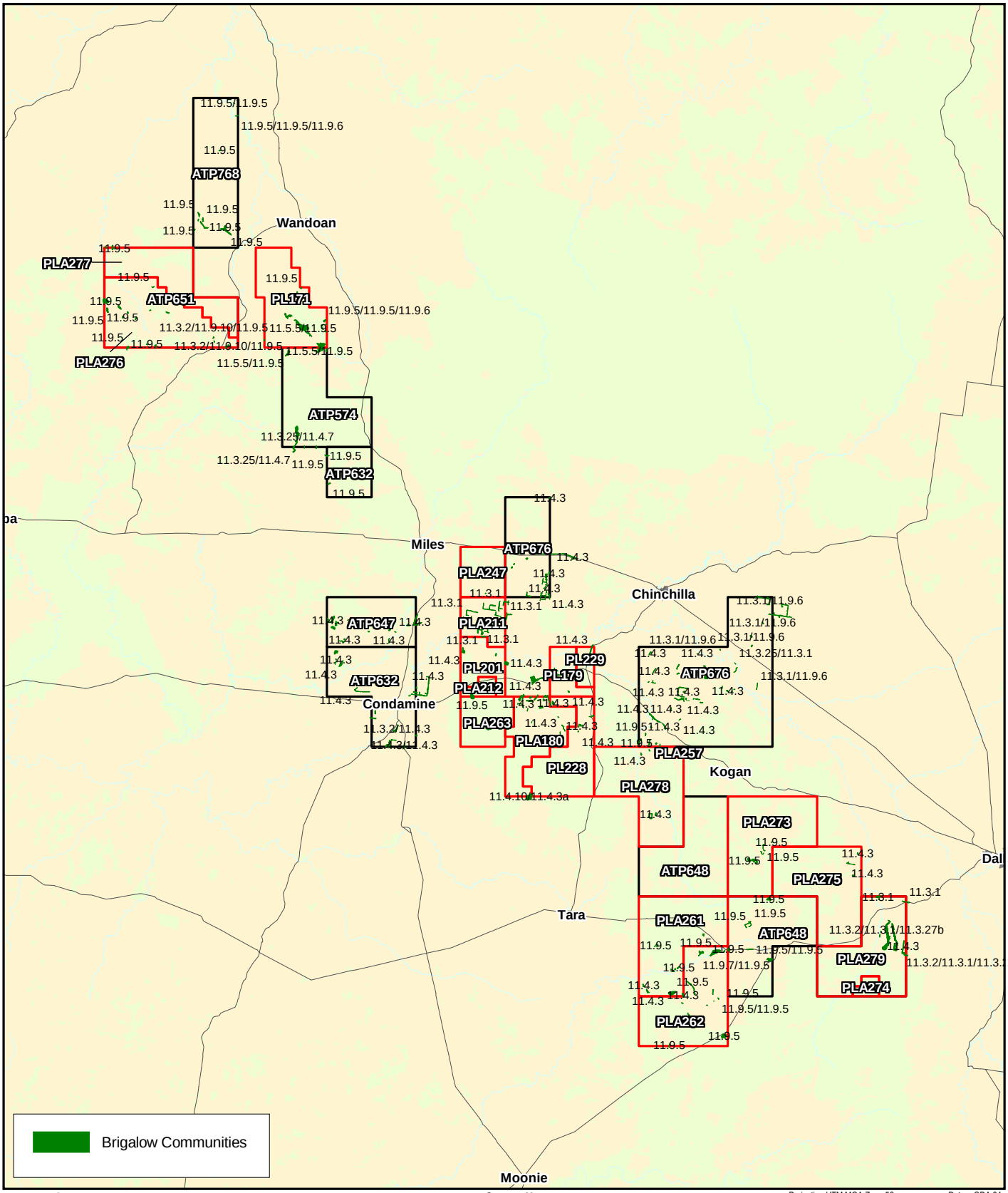

Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

1:250,000 Topographic data copyright Commonwealth of Australia
Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project	Title: **Brigalow Woodland / Open Forest Communities**	
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	Annex 13.1	Figure 13.14
	Approved: CDP	File No: QC02-T-MA-00105	
	Date: 17.07.09	Revision: A	

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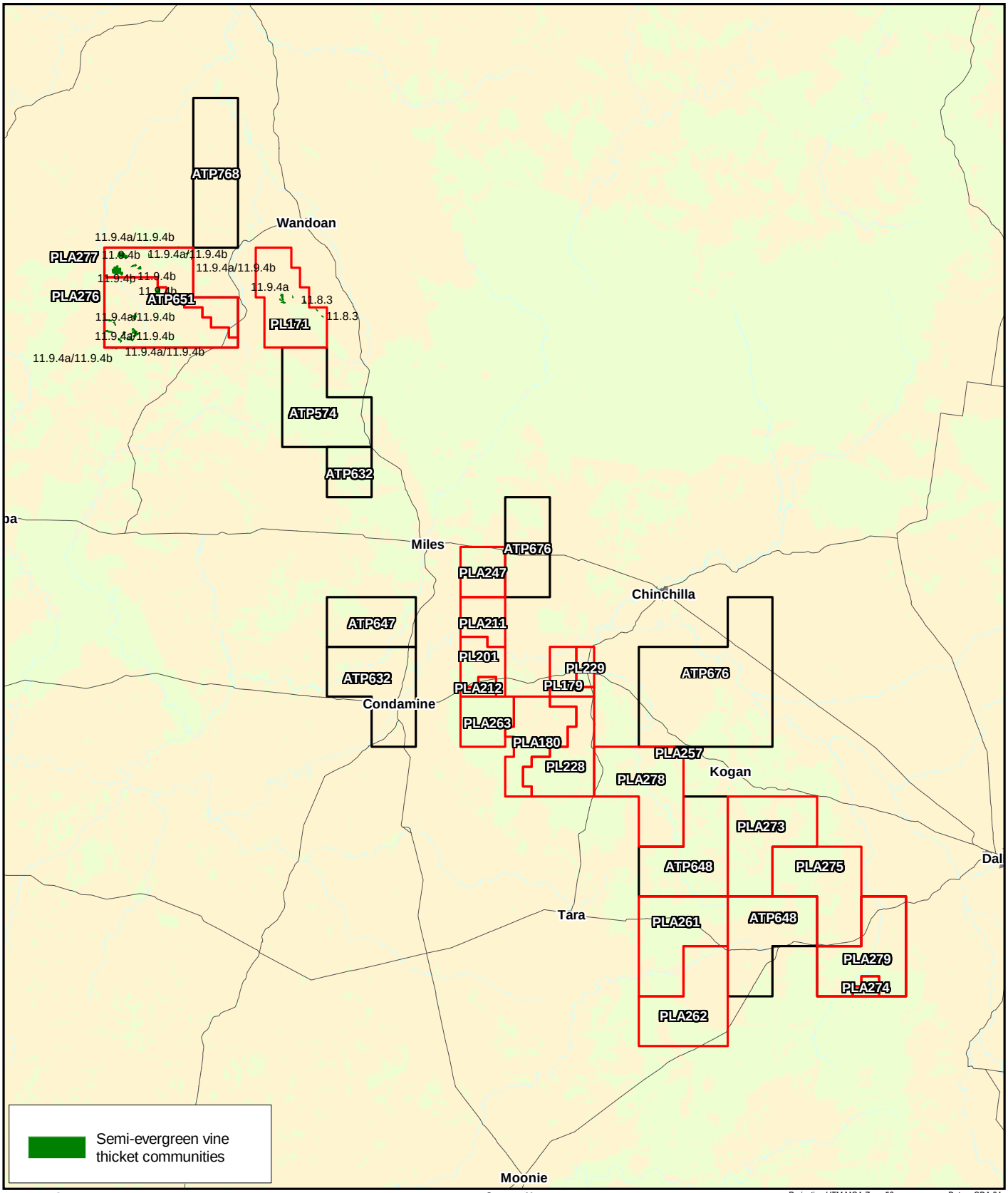

Legend:

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- Gas Fields - Authority to Prospect

Source Note:

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Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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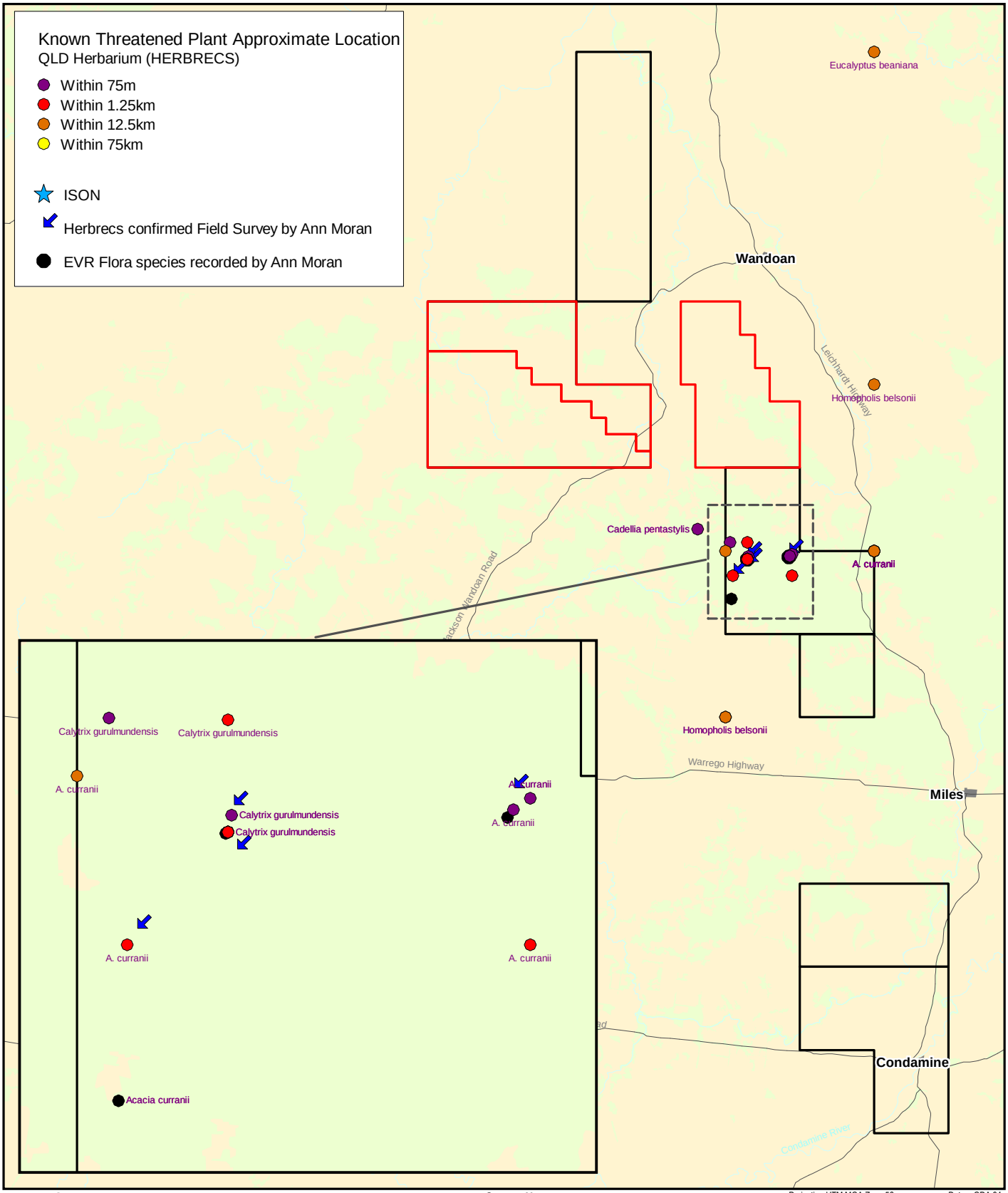
QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Semi-evergreen Vine Thicket Communities**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	**Annex 13.1** **Figure 13.15**	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CDP	File No: QC02-T-MA-00106	
	Date: 17.07.09	Revision: A	



Legend:

Gas Fields - Petroleum Lease/Petroleum Lease Application

Gas Fields - Authority to Prospect

Source Note:

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EVR Data sourced from Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 5 10 15 20 25

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project	Title	Known EPBC Listed Flora Species Locations
Client	QGC - A BG Group business		Map 1 of 2

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Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	Annex 13.1	Figure 13.16
Approved	CDiP	File No:	QC02-T-MA-00091
Date	17.07.09	Revision	A

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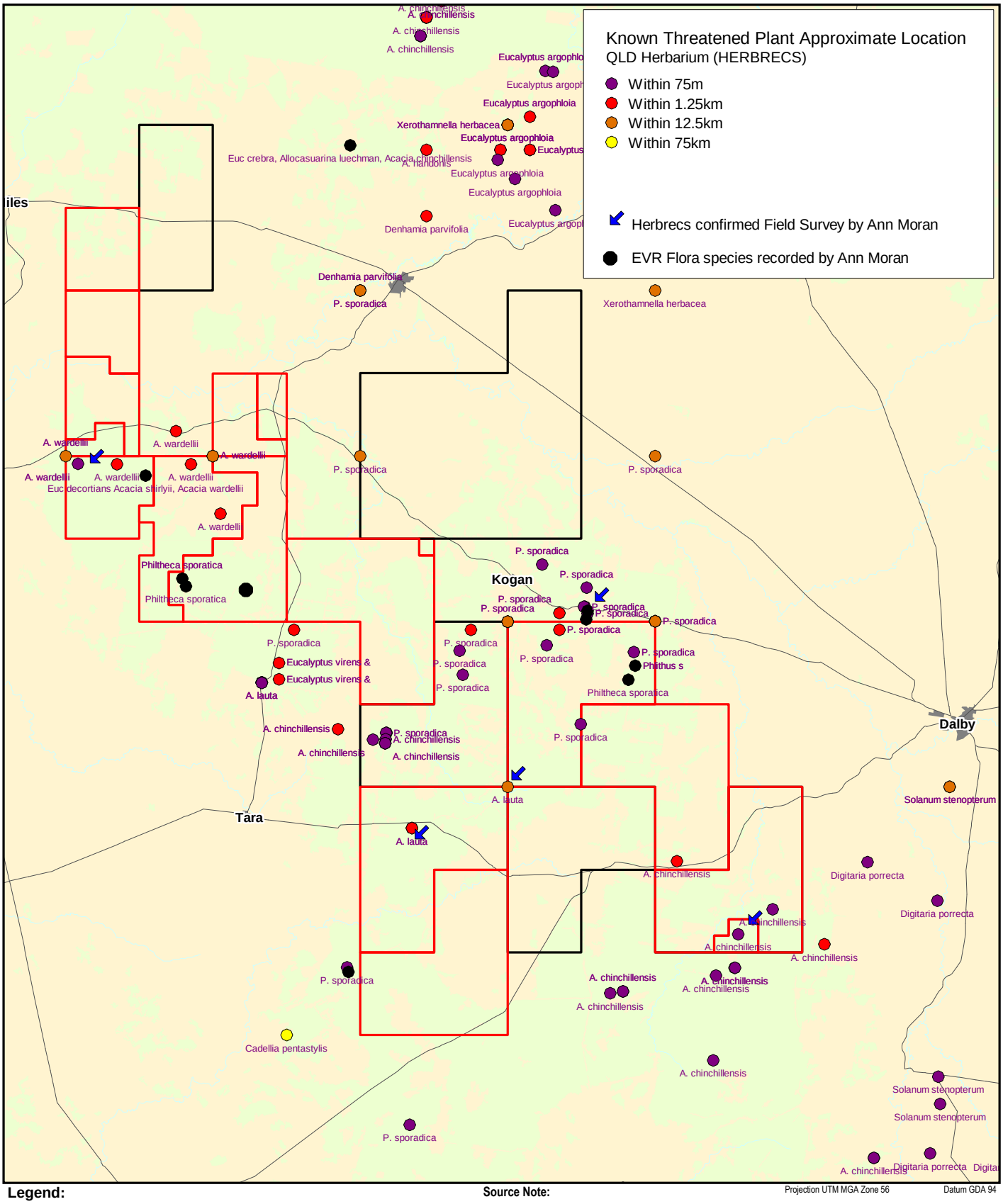

Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

1:250,000 Topographic vector copyright Geoscience Australia
EVR data sourced from Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 5 10 15 20 25

Kilometres

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project	Title: **Known EPBC Listed Flora Species Locations**	Map 2 of 2
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	**Annex 13.1**	**Figure 13.17**
	Approved: CDP	File No: QC02-T-MA-00092	
	Date: 17.07.09	Revision: A	

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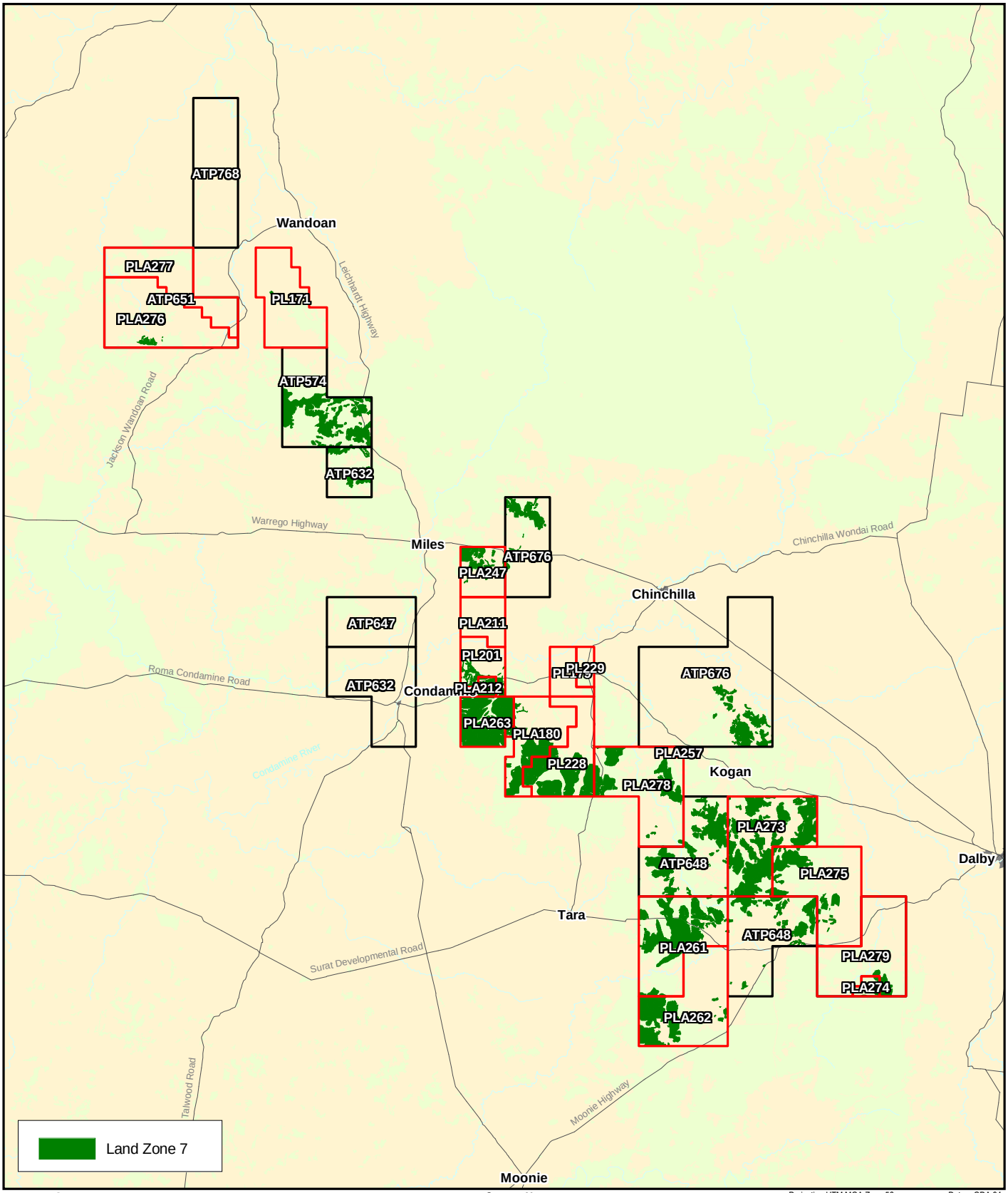

Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

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Regional Ecosystem v5.0 copyright Queensland Herbarium

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40
Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

ERM
Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project	Title	Regional Ecosystem Land Zone 7
Client	QGC - A BG Group business		
Drawn	Mipela	Annex 13.1	Figure 13.18
Approved	CDP	File No:	QC02-T-MA-00003
Date	17.07.09	Revision	A

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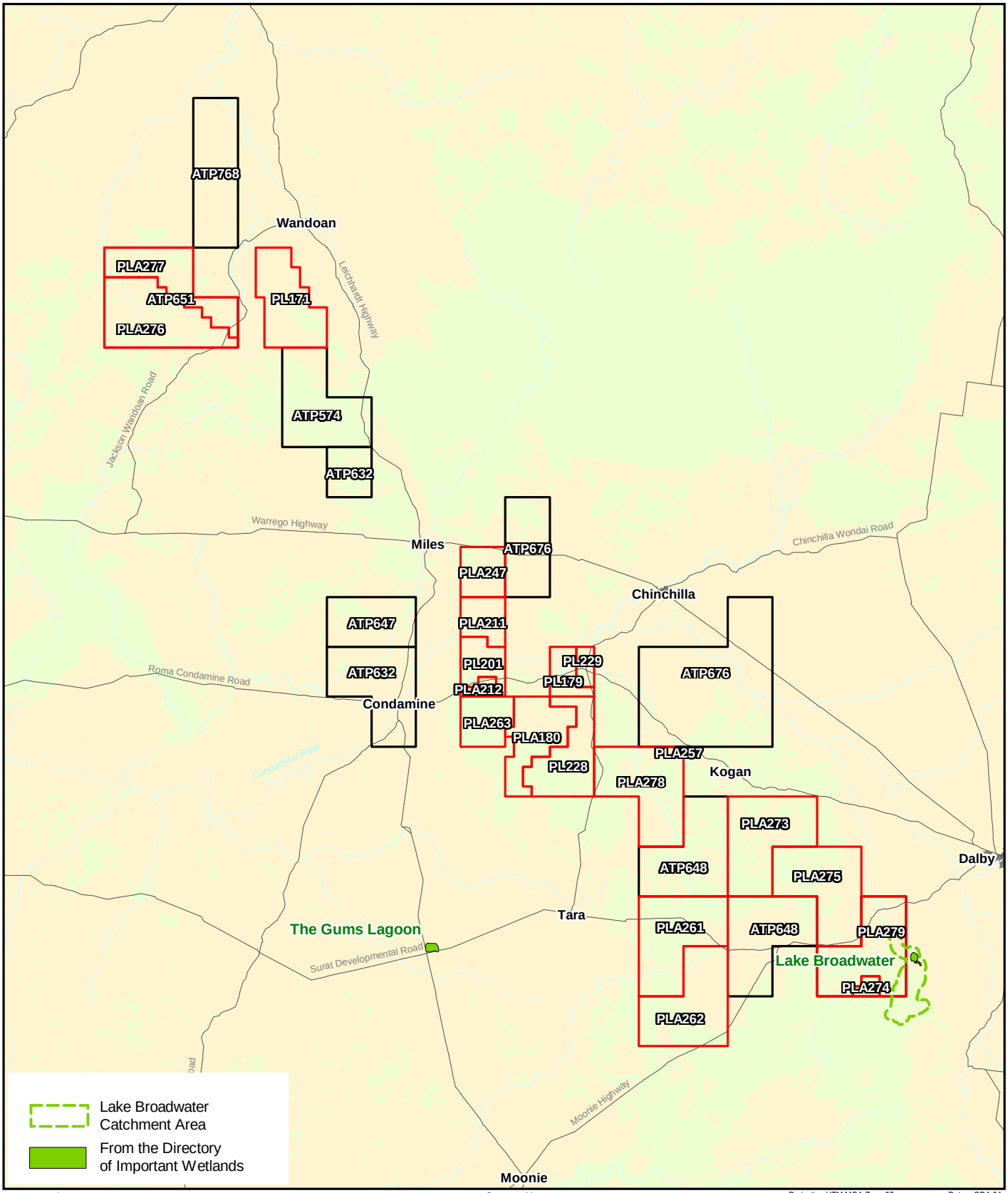

Legend:

- Gas Fields - Petroleum Lease/Petroleum Lease Application
- Gas Fields - Authority to Prospect

Source Note:

1:250,000 Topographic Vector copyright Geoscience Australia
Important Wetlands copyright Department of Primary Industries
Coastal Wetland Vegetation

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title **Important Wetlands Areas**

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Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	**Annex 13.1**	**Figure 13.19**
Approved	CDP	File No:	QC02-T-MA-00107
Date	17.07.09	Revision	A

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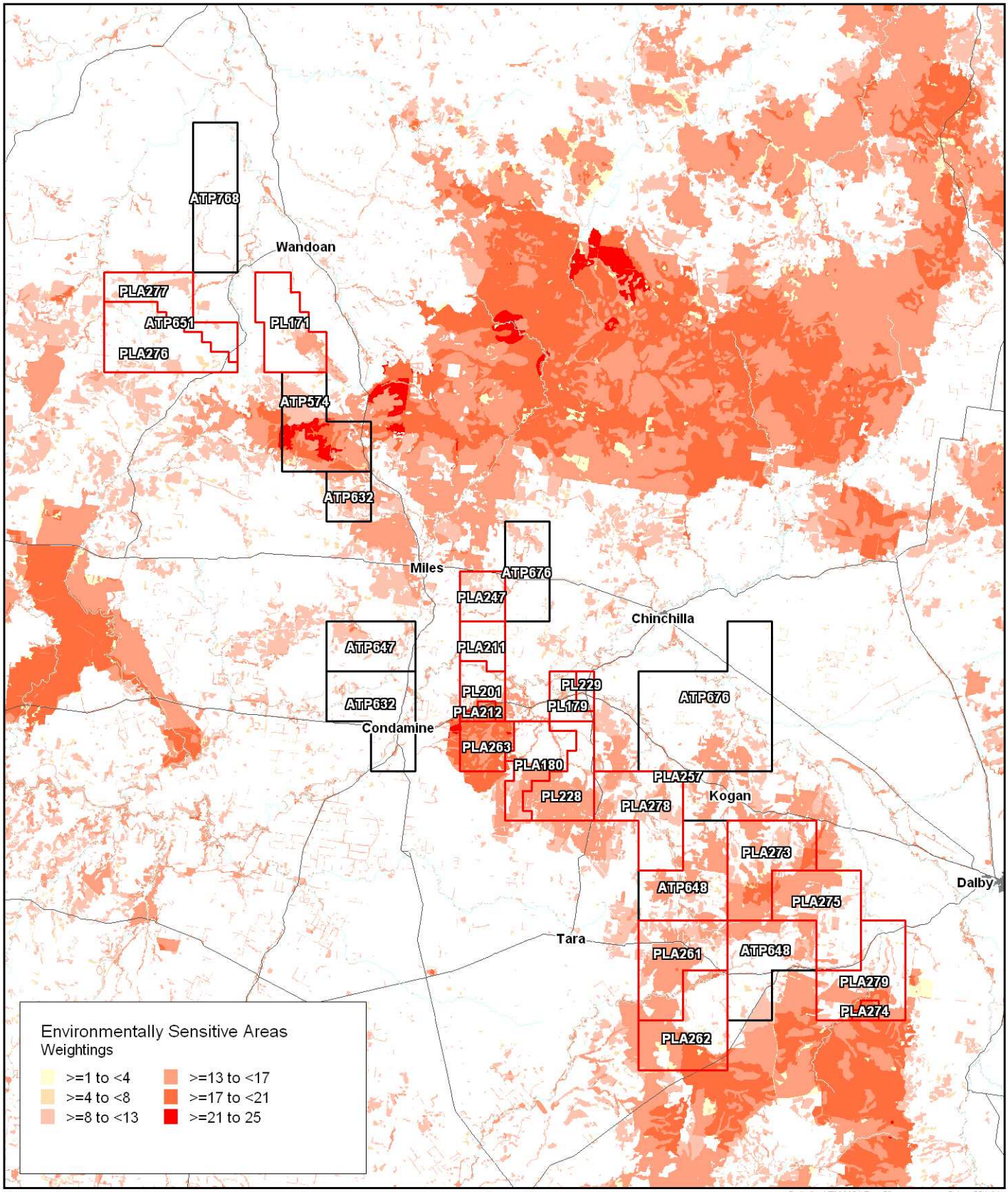

Legend:

Gas Fields - Petroleum Lease/Petroleum Lease Application

Gas Fields - Authority to Prospect

Source Note:

Biodiversity Assessment data copyright of Queensland Environmental Protection Agency

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project	Title	Environmentally Sensitive Areas (Weighted)
Client	QGC - A BG Group business		

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Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	Annex 13.1	Figure	13.20	
Approved	CDP	File No:	QC02-T-MA-00108		
Date	17.07.09	Revision	A		

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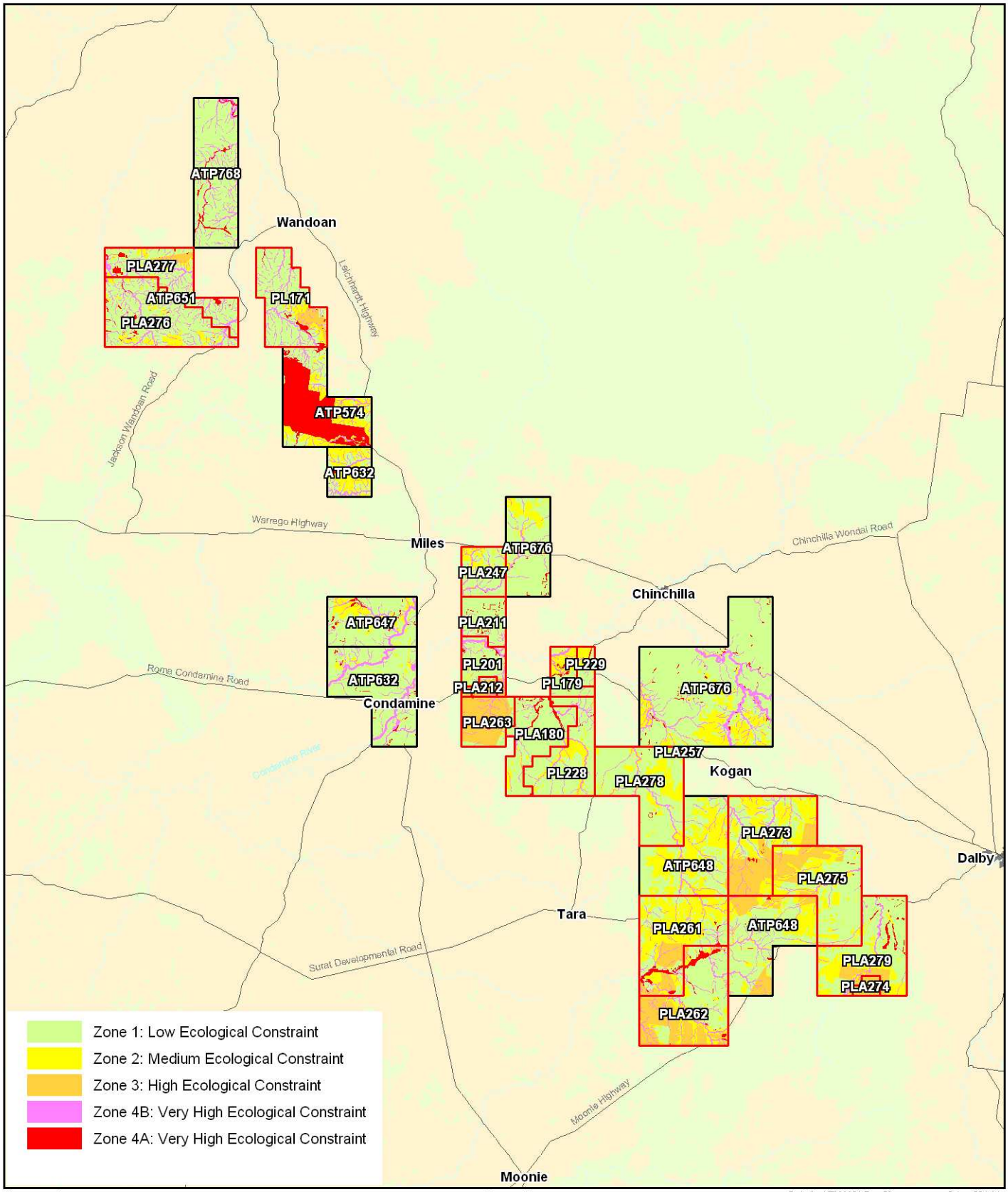

Legend:

Gas Fields - Petroleum Lease/Petroleum Lease Application

Gas Fields - Authority to Prospect

Source Note:

Regional Ecosystems v5.0 copyright QLD Herbarium
QLD Protected Areas copyright Environment Protection Agency
DCDB data copyright State of Queensland (2008)

Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

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QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: **Gas Fields - Ecological Constraints Zones**

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	Mipela	Annex 13.1	Figure 13.21
Approved	CDP	File No:	QC02-T-MA-00109
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ATTACHMENT 2 - EXISTING EIA CONDITIONS

ecoaccess
environmental licences and permits

RECEIVED
0 9 APR 2009
BY:

Notice of Decision – Amendment Application

This notice is issued by the Environmental Protection Agency to advise of a statutory decision made under section 124 of the Environmental Protection Act 1994.

Queensland Gas Company Limited
30 Herschel Street
BRISBANE QLD 4001

C/c Tenures Support Unit: Petroleum and Gas
Department of Mines and Energy
PO Box 1475
COORPAROO QLD 4151

Our Reference: 315757

Dear Sir/Madam

Re: Amendment of environmental authority PEN100020207

The EPA has assessed the application received on 02-MAY-2008 to amend environmental authority PEN100020207 and wishes to advise you that the application has been GRANTED.

If you require more information please contact Elizabeth Dunlop (07) 3225 1056.

Parma Nand
Delegate
Environmental Protection Agency

Enquiries:
Petroleum and Gas Unit
Ph. (07) 3225 1056
Fax. (07) 3225 8723

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Environmental Protection Agency
Petroleum and Gas Unit
GPO Box 2771
BRISBANE QLD 4001

Environmental Authority (Petroleum Activities) Permit Number PEN100020207

Section 310Y *Environmental Protection Act 1994*

This environmental authority is granted under the Environmental Protection Act 1994 and includes conditions to minimise environmental harm caused, or likely to be caused, by the authorised petroleum activities. An environmental authority (petroleum activities) may be for petroleum activities authorised (under the Petroleum and Gas (Production and Safety) Act 2004, Petroleum Act 1923 or Petroleum (Submerged Lands) Act 1982) to occur under one of the following petroleum authorities: authority to prospect; petroleum lease, data acquisition authority, water monitoring authority, petroleum facility licence, survey licence or pipeline licence. In general, a petroleum activity means an activity that, under the relevant petroleum legislation, is an authorised activity, rehabilitation, remediation, and includes facilitation and supporting activities and any action taken to prevent environmental harm.

Under the provisions of the *Environmental Protection Act 1994*, this environmental authority (petroleum activities) is issued to:

Principal Holder

Queensland Gas Company Limited
30 Herschel Street
BRISBANE QLD 4000

Joint Holders

BG International Limited
Origin Energy CSG Limited

in respect of carrying out Level 1 and 2 petroleum activities under Section 23 of the Environmental Protection Regulation 2008 and the following Level 1 petroleum activities under Schedule 5 of the *Environmental Protection Regulation 2008*:

Activity	Description
Schedule 5, No. 3	A petroleum activity that is likely to have a significant impact on a category A or B environmentally sensitive area.
Schedule 5, No. 6	A petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam
Schedule 5, No. 8	A petroleum activity, other than a petroleum activity mentioned in items 1 to 7, that includes a chapter 4 activity for which an aggregate environmental score is stated, including: 15 Fuel Burning – any process involving the use of fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour. 38(2B) Surface Coating – coating painting or powder coating, using, in a year, 1t – 100t of surface coating materials. 60(1D) Waste Disposal – operating a facility for disposing of, in a year, more than 200 000t of any, or any combination of regulated waste and general waste. 63(2A) Sewage Treatment – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of 21 to 100 equivalent persons.

and the following Environmentally Relevant Activities under Schedule 2 of the *Environmental Protection Regulation 2008*:

Activity	Description
8(3A)	Chemical Storage – storing 10m3 to 500m3 of chemicals of class C1 or C2 combustible liquids under AS1940 or dangerous goods class 3.
18(A)	Boiler Making or Engineering— carrying out boilermaking, assembling, building or manufacturing a total of 200t to 1000t of metal product in a year.

on the relevant petroleum authorities identified below:

Relevant Petroleum Authority(s)	Project Number	Location Description
Authority to Prospect 610 Authority to Prospect 620 Authority to Prospect 621 Authority to Prospect 632 Authority to Prospect 648 Authority to Prospect 651 Petroleum Lease 179 Petroleum Lease 180 Petroleum Lease 211 Petroleum Lease 228 Petroleum Lease 229 Petroleum Lease 247 Petroleum Lease 257	Walloon Fairway	See Appendix 3

This environmental authority (petroleum activities) [the "authority"] is subject to the condition that the holder carry out the above environmentally relevant activities in accordance with the conditions set out in the attached schedules.

This environmental authority takes effect from the **date when each environmental authority holder becomes the holder of a relevant petroleum authority.**

The anniversary date of this authority is **23 November**.

Signed

06 APRIL 2009
Date

Parma Nand
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This environmental authority document is not proof of the current status of the environmental authority. The current status of the environmental authority may be ascertained by contacting the administering authority.

SCHEDULE OF CONDITIONS

This environmental authority incorporates the following schedules of conditions relevant to various issues:

Schedule A - General Conditions
Schedule B - Air Emissions
Schedule C - Water Management
Schedule D - Management of Associated Water
Schedule E - Noise Management
Schedule F - Waste Management
Schedule G - Land Management
Schedule H - Sewage Treatment and Effluent Management
Schedule I - Storage and Handling of Chemicals, Flammable and Combustible Substances
Schedule J - Drilling Operations
Schedule K - Environmentally Sensitive Areas
Schedule L - Declared Wild River Areas
Schedule M - Petroleum Infrastructure
Schedule N - Regulated Dams
Schedule O - Compressor Stations
Schedule P - Monitoring Programs
Schedule Q - Community Issues
Schedule R - Notification Procedures

APPENDIX 1 - Definitions
APPENDIX 2 - Environmentally Sensitive Areas
APPENDIX 3 - Maps, Figures and Approved Plans
APPENDIX 4 - Determining Hazard Categories for Regulated Dams

SCHEDULE A GENERAL

PREVENT AND/OR MINIMISE LIKELIHOOD OF ENVIRONMENTAL HARM

(A1) This authority does not authorise environmental harm unless a condition contained within this authority explicitly authorises that harm. Where there is no condition or the authority is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.

(A2) In carrying out petroleum activities the holder of this authority must prevent and / or minimise the likelihood of environmental harm being caused.

DEVELOPMENT PLAN

(A3) The applicant for or holder of the environmental authority must submit to the administering authority a copy of the original or any amended work program or development plan for the relevant application for the granted petroleum authority 8 business days before commencing activities or additional or varied activities covered by the program or plan.

MAINTENANCE OF MEASURES, PLANT AND EQUIPMENT

(A4) The holder of this authority must:

a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this authority; and
b) maintain such measures, plant and equipment in a proper and efficient condition; and
c) operate such measures, plant and equipment in a proper and efficient manner.

(A5) All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this authority must be calibrated, appropriately operated and maintained.

(A6) The holder of this authority must ensure that daily operation and maintenance of all plant and equipment relating to the authorised petroleum activities are carried out by suitability qualified, competent and experienced person(s).

(A7) No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration increases the risk of environmental harm from the petroleum activities.

(A8) All analyses and tests required to be conducted under this authority must be carried out by a laboratory that has NATA certification for such analyses and tests, except as otherwise authorised by the administering authority.

ENVIRONMENTAL MANAGEMENT PLAN

(A9) The holder of the environmental authority should have in place and implemented an environmental management plan from the commencement of the level 1 petroleum activity. The EMP must identify all sources of environmental harm, including but not limited to the actual and potential release of all contaminants, the potential impact of these sources and what actions will be taken to prevent the likelihood of environmental harm being caused. The EMP must also provide for the review and 'continual improvement' in the overall environmental performance of all petroleum activities that are carried out.

The EMP must address as a minimum the following matters:

a) Environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals.

b) Identification of environmental issues and potential impacts.
c) Control measures for routine operations to minimise likelihood of environmental harm.
d) Contingency plans and emergency procedures for non-routine situations.
e) Organisational structure and responsibility.
f) Effective communication.
g) Monitoring of contaminant releases.
h) Conducting environmental impact assessments.
i) Staff training.
j) Record keeping.
k) Periodic review of environmental performance and continual improvement.

(A10) The environmental management plan must not be implemented or amended in a way that contravenes any condition of this approval.

(A11) A suitably qualified person must certify in writing that an environmental management plan has been prepared:

a) by a suitably qualified person with at least 5 years experience in the relevant area;
b) in a manner that is consistent with the requirements of Condition (A9); and
c) by having regard to, and appropriately applying, the relevant guidelines (being those applicable on a national, state or a regional basis) which the suitably qualified person considers should be applied in undertaking the environmental management plan including relevant approved Environment Australia, ANZECC and EPA guidelines where published.

FINANCIAL ASSURANCE

(A12) The holder of this authority must provide a financial assurance in the amount and form required by the administering authority for the authorised petroleum activities.

(A13) The financial assurance is to remain in force until the administering authority is satisfied that no claim is likely to be made on the assurance.

DEFINITIONS

(A14) Words and phrases used in this authority are defined in Appendix 1 – Definitions. Where a definition for a term used in this authority is not defined within this authority, the definitions in the *Environmental Protection Act 1994*, its Regulation and Environmental Protection Policies must be used.

SCHEDULE B AIR EMISSIONS

DUST AND PARTCULATE MANAGEMENT

(B1) The release of any dust and particulate matter resulting from the petroleum activities must not cause an environmental nuisance at any sensitive or commercial place.

(B2) In relation to a complaint received in Condition (B1), dust and particulate matter must not exceed the following levels at any sensitive or commercial place:

a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with AS 3580.10.1 *Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991*; or

b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the site, when monitored in accordance with AS3580.9.6 *'Ambient air – Particulate matter – Determination of suspended particulate PM10 high-volume sampler with size-selective inlet Gravimetric method'*.

ODOUR MANAGEMENT

(B3) The release of noxious and / or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the petroleum activity must not cause an environmental nuisance at any sensitive or commercial place.

ALTERNATIVE ARRANGEMENTS AVAILABLE WHEN AIR EMISSIONS MAY CAUSE NUISANCE

(B4) Where the holder of this authority has, at their cost, made alternative arrangements to the satisfaction of and with the written agreement of each person affected by nuisance air emissions at a sensitive or commercial place, then the requirements specified in conditions (B1)-(B3) will not apply at that sensitive or commercial place for the period of the alternative arrangements.

(B5) As a minimum each written agreement of an alternative arrangement must state:

a) the location of the sensitive or commercial place;
b) the names of the affected persons;
c) the nature of the alternative arrangement(s) (e.g. provision of alternative accommodation); and
d) the period of the alternative arrangement(s).

GREEN HOUSE GAS EMISSIONS

(B6) The sulphur content of fuel burned in power generators must not exceed 0.5 percent by weight.

SCHEDULE C WATER MANAGEMENT

RELEASE TO WATERS

(C1) The holder of this authority must ensure that the petroleum activities do not result in the release of contaminants to waters unless specifically authorised under this authority.

STORMWATER MANAGEMENT

(C2) Except as otherwise provided by the conditions of this authority, petroleum activities must be carried out by such reasonable and practicable means necessary to prevent the contact of incident rainfall and stormwater runoff with waste or other contaminants.

(C3) All stormwater treatment devices must be maintained in proper and efficient working condition.

(C4) The maintenance and cleaning of vehicles and other equipment or plant must be carried out in purpose built facilities or areas where the resultant contaminants will not be released to any waters.

(C5) A stormwater management system must be designed, implemented and maintained so that:

a) in areas with the potential for significant erosion, contour banks and diversion drains are constructed to minimise the potential for overland flow to enter areas disturbed by petroleum activities;
b) erosion and sediment control structures are placed to minimise erosion of disturbed areas and prevent the contamination of any waters; and
c) contaminated stormwater runoff and leachate is collected; and treated, reused, or released in accordance with the conditions of this authority.

GROUNDWATER MONITORING

(C6) The holder must prepare and submit a groundwater monitoring program to the administering authority within 3 months of the date of issue of this authority. If the administering authority gives to the holder of this authority any comment on the monitoring program within 21 days of receiving the document, the holder of this approval must have due regard to those comments when implementing the monitoring program.

(C7) Where production is due to commence in a new area, an amended ground water monitoring program covering the new production areas must be submitted to the administering authority at least 60 days prior to production commencing.

(C8) The groundwater monitoring program must be able to detect any significant changes to groundwater quality and level due to activities authorised under this authority at shallow, intermediate and deep groundwater depths. The program must:

a) include a groundwater monitoring network designed and installed for the ponds containing saline water;
b) include a sufficient number of monitoring sites to provide adequate information to:
   i. detect seepage from the ponds and understand effects on groundwater;
   ii. benchmark monitoring sites (i.e. background groundwater quality in hydraulically up-gradient or background bore(s) that have not been affected by any release of contaminants to groundwaters);
c) include location of monitoring points, parameters to be measured, frequency of monitoring, monitoring methodology used, trigger values;
d) develop procedures to establish background ground water quality; and

e) be installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters.

(C9) The method of water sampling required by this authority must comply with that set out in the latest edition of the Environmental Protection Agency's Water Quality Sampling Manual.

(C10) The Groundwater Monitoring Program must provide for monitoring of groundwater quality as often as necessary to detect impacts of the petroleum activities, but not less frequently than biannually (every six months) for the first year of carrying out the petroleum activities and annually thereafter.

(C11) Groundwater samples taken as part of the Groundwater Monitoring Program must be analysed for at least the following water quality parameters:

a) groundwater level (mAHD)
b) pH (pH scale);
c) Electrical conductivity (mS/cm);
d) SAR

(C12) All groundwater monitoring bores must be maintained in an operative condition and be reasonably accessible at all times to any authorised person.

(C13) All determinations of groundwater quality and the evaluation/explanation of data for the purposes of the annual monitoring report must be performed by a person or body possessing appropriate experience and qualifications to perform the required determinations and must include an assessment as to whether there is any groundwater contamination and, if so, the level of environmental harm caused as a result of such contamination.

GROUNDWATER MONITORING ANALYSIS REPORTING

(C14) The holder of this authority must ensure that the groundwater monitoring data gathered in accordance with this authority is analysed and interpreted to assess the nature and extent of any environmental impact of the environmentally relevant activity. The data, analysis and assessment must be submitted to the administering authority:

a) on request; or
b) with each Annual Return; and
c) when any significant changes in aquifer connectivity, water level and/or groundwater quality relative to bores that are identified as benchmark groundwater quality bores are detected within 14 days of receipt of analysis.

(C15) If groundwater monitoring indicates that changes as described in Condition (C13) occur, then the information required must include any proposed actions to mitigate the changes in groundwater quality or quantity as well as means to prevent the event recurring.

DETERMINING WATER QUALITY CONTAMINANTS

(C16) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the latest edition of the Environmental Protection Agency Water Quality Sampling Manual, and carried out on samples that are representative.

SCHEDULE D MANAGEMENT OF ASSOCIATED WATER

ASSOCIATED WATER MANAGEMENT PLAN

(D1) The holder of this authority must develop and submit to the administering authority an Associated Water Management Plan (AWM Plan) for the proposed petroleum activities. The AWM Plan must adequately identify and quantify all waste generated and propose management options for disposing of or beneficially reusing associated water. The AWM Plan must address the following matters:

a) identification of environmental issues and potential impacts;
b) control measures for routine operations to minimise likelihood of environmental harm;
c) contingency plans and emergency procedures for non-routine situations;
d) organisational structure and responsibility;
e) effective communication;
f) monitoring of contaminant releases;
g) conducting environmental impact assessments;
h) staff training;
i) record keeping; and
j) periodic review of environmental performance and continual improvement.

(D2) The AWM Plan must set specific performance goals, identify measures to achieve or maximise the beneficial reuse of associated water and minimise the generation or emissions of potential contaminants to the receiving environment. The Plan should:

a) State the objectives to be achieved and maintained under the Plan;
b) State how the objectives are to be achieved and a timetable to achieve the objectives taking into account –
   i. Best practice environmental management;
   ii. Current technology; and
   iii. Risks of environmental harm being caused.
c) State appropriate performance indicators at time intervals of not more than 12 months;
d) Make provisions for monitoring and reporting compliance with this Plan; and
e) State how the AWM Plan will comply with the requirements of the 'Queensland Coal Seam Gas Water Management Policy, released 31 October 2008.

(D3) The holder of this authority must submit the AWM Plan for review to the administering authority within twelve (12) months after this authority is issued.

(D4) The AWM Plan must not be implemented or amended in a way that contravenes any condition of this authority.

(D5) The holder of this authority must review the AWM Plan every 3 years. The review must consider current strategies, best practice alternatives, advances in new technology, standards and practices in relation to the management of associated water, new beneficial use proposals and the management of respective waste streams.

(D6) Subject to Condition (D5), the holder will need to provide justification why existing management strategies and standards should be continued.

(D7) The holder must provide the monitoring and compliance report upon request to the administering authority and/or on submission of annual return. The report must provide information on the amount of water produced, monitoring reports, contaminant loads and how waste streams are being managed in accordance with the AWM Plan.

EXISTING AUTHORISED USES OF ASSOCIATED WATER

(D8) The holder of this authority must ensure that associated water is not released to land or waters, unless specifically authorised under:

a) this authority; or
b) under Section 186 of the *Petroleum and Gas (Production and Safety) Act 2004*; or
c) under Section 86 of the *Petroleum Act 1923*; or
d) under Section 74 of the *Water Act 2000; or*
e) under sections 66B-M of the *Environmental Protection (Waste Management) Regulation 2000.*

(D9) Despite Condition (D8) a) or (D8) b), the holder of this authority must ensure that the associated water to be used for domestic or stock purposes meets the accepted ANZECC 2000 Water Quality Guidelines, or subsequent versions thereof, for stock and domestic purposes.

(D10) The release of associated water must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm and that the release of associated water must be carried out in a manner that ensures that:

a) vegetation is not damaged;
b) soil erosion and soil structure damage is avoided;
c) the quality of groundwater is not adversely affected;
d) discharge of associated water will be controlled so that there is no water runoff from the nominated discharge areas; and
e) there are no releases of associated water to any surface waters.

DUST SUPPRESSION AND CIVIL CONSTRUCTION ACTIVITIES

(D11) The holder of this authority may use associated water produced from the authorised petroleum activities for civil construction and dust suppression on the relevant petroleum authority, provided the usage is appropriately managed and that the water meets the criteria outlined in Schedule D – Table 1.

Schedule D - Table 1 Construction and Road Maintenance Water Contaminant Release Limits.

PARAMETER	UNITS	MINIMUM	MAXIMUM
pH	ph Units	6	9
Total Dissolved Salts	mg/L	Not specified	2000
Electrical Conductivity	µS/cm	Not specified	2000
TPH	mg/L	Not specified	10

(D12) Subject to Condition (D11), the holder of this authority must ensure that any irrigation of associated water for construction and/or road maintenance activities must be carried out in a manner that:

a) vegetation is not damaged;
b) soil erosion and soil structure damage is avoided;
c) there is no surface ponding of the recycled water;
d) quality of groundwater is not adversely affected; and
e) there are no releases of associated waters to any surface waters.

SCHEDULE E NOISE MANAGEMENT

NOISE MANAGEMENT

(E1) Prior to undertaking petroleum activities that are likely to impact upon a sensitive or commercial place, the holder of this authority must investigate potential noise emissions from the proposed petroleum activities and determine if noise emissions are likely to exceed the limits set in Condition (E3).

(E2) If noise emissions are likely to exceed the limits specified in Condition (E3), then the holder must take appropriate measures to either relocate the petroleum activity or incorporate noise abatement and / attenuation measures to mitigate those impacts. These measures must be in place prior to undertaking the proposed petroleum activity.

(E3) Noise emitted from any aspect of the petroleum activities must not exceed the noise levels, specified in the table below, at any sensitive place or commercial place, other than those owned by the holder of this authority.

Schedule E – Table 1 – Noise limits

Time period	Noise level at a *sensitive place* measured as the Adjusted Maximum Sound Pressure Level $L_{A\ max,\ adj,\ T}$
7am– 6 pm	Background noise level plus 5 dB (A)
6pm–10pm	Background noise level plus 5 dB (A)
10pm–7am	Background noise level plus 3 dB (A)
Time period	Noise level at a *commercial place* measured as the Adjusted Maximum Sound Pressure Level $L_{A\ max,\ adj,\ T}$
7am –6 pm	Background noise level plus 10 dB (A)
6pm–10pm	Background noise level plus 10 dB (A)
10pm–7am	Background noise level plus 8 dB (A)

(E4) In the event of a complaint regarding noise from the petroleum activities at a **sensitive place** or **commercial place**, the holder of this authority must conduct an appropriate investigation and must implement remedial action, if the noise from the petroleum activities exceeds the noise limits in Schedule F Table 1 – Noise Limits at the sensitive place or commercial place.

(E5) The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual or the most recent version of AS1055 *Acoustics – Description and measurement of environmental noise* and the EPA guideline, Assessment of low frequency noise and the EcoAccess guideline, Planning for noise control.

ALTERNATIVE ARRANGEMENTS AVAILABLE WHEN NOISE EMISSIONS MAY CAUSE NUSIANCE FOR LIMITED PERIODS

(E6) Where the holder of this authority has, at their cost, made alternative arrangements to the satisfaction of and with the written agreement of each person affected by nuisance noise

emissions at a sensitive or commercial place, then the requirements specified in Table E1- Noise Limits will not apply at that sensitive or commercial place for the period of the alternative arrangements.

(E7) As a minimum each written agreement of an alternative arrangement must state:

a) the location of the sensitive or commercial place;
b) the names of the affected persons;
c) the nature of the alternative arrangement(s) (e.g. provision of alternative accommodation); and
d) the period of the alternative arrangement(s).

SCHEDULE F WASTE MANAGEMENT

(F1) A Waste Management Program (WMP) in accordance with Part 5 of the *Environmental Protection (Waste Management) Policy 2000* must be developed, implemented and maintained for the authorised petroleum activities.

(F2) The holder of this authority must ensure that petroleum activities do not result in the release or likely release of a hazardous contaminant to land or waters.

(F3) Any spillage of hazardous contaminants or other contaminants that may cause environmental harm must be effectively contained and/or cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, or otherwise thereby releasing such waste or contaminants to any land or waters.

(F4) The holder of this authority must ensure that all general waste produced by the petroleum activities is removed from the relevant petroleum authority and disposed to a facility licensed to accept such waste.

(F5) All regulated waste removed from the site must be removed by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a facility licensed to accept such waste.

(F6) When regulated waste is removed from within the boundary of the petroleum authority and transported by the holder of this authority, a record must be kept of the following:

a) date of waste transport;
b) quantity of waste removed and transported;
c) type of waste removed and transported;
d) route selected for transport of waste;
e) quantity of waste delivered; and
f) any incidents (e.g. spillage) that may have occurred en route.

(F7) If a person removes regulated waste associated with activities within the petroleum authority and disposes of such waste in a manner which is not authorised or is improper or unlawful then, as soon as practicable, notify the administering authority of all relevant facts, matters and circumstances known concerning the disposal.

SCHEDULE G LAND MANAGEMENT

MINIMISING DISTURBANCE TO LAND AND SOIL MANAGEMENT

(G1) The holder of the environmental authority must:

a) minimise disturbance to land in order to prevent land degradation; and
b) ensure that for land that is to be significantly disturbed by petroleum activities, the top layer of the soil profile is removed; and
   i. stockpiled in a manner that will preserve its biological and chemical properties, and
   ii. used for rehabilitation purposes in accordance with Condition (G19 and G20).

(G2) The holder of this authority must:

a) minimise the risk to wildlife and stock; and
b) construct borrow pits in a manner that will enable effective restoration consistent with the surrounding landuse where the borrow pit is owned by QGC.

VEGETATION MANAGEMENT

(G3) The holder of this authority must:

a) prevent or minimise disturbance to vegetation;
b) manage the effects of clearing to prevent the loss of biodiversity, reduction of ecological processes and land degradation.

(G4) The holder of this authority must consider whether it is feasible to avoid clearing, and where viable alternatives exist, must not clear vegetation:

a) in, or within 50 metres of, the static high water mark of lakes or springs;
b) in a way that isolates clumps or dissects corridors of vegetation;
c) on slopes greater than 5%;
d) on dispersible soils; and
e) in existing or potential discharge areas.

(G5) Clearing must be limited to the extent that is necessary for the conduct of coal seam gas activities.

(G6) Clearing of remnant vegetation for the purpose of establishing roads or tracks, shall not exceed 10 metres in width.

(G7) Clearing must not occur (with the exception of Condition (G17)):

a) in any natural wetland;
b) within 100 metres from any natural wetland;
c) in any natural significant wetland; and
d) within 200 metres from any natural significant wetland.

(G8) Clearing must not occur (with the exception of Condition (G17)):

a) in any watercourse; and
b) within the relevant distance stipulated in Schedule G - Table 1 — Distance from the high banks of water courses in which clearing cannot occur.

Schedule G - Table 1: Distance from the high banks of watercourses in which clearing cannot occur

Stream Order	*Subregion*	*Distance from Each High Bank*
1 or 2	*Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion*	*50 metres*
3 or 4	*Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion*	*100 metres*
5 or greater	*Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion*	*200 metres*

(G9) As coal seam gas infrastructure will be located within areas containing *endangered* and/or *of concern* regional ecosystems, an appropriate offset in accordance with the *Policy for Vegetation Management Offsets – 28 September 2007* will need to be proposed.

(G10) Clearing must not occur in an area shown as essential habitat on the essential habitat map. If clearing will occur within an area of essential habitat, an appropriate offset in accordance with the *Policy for Vegetation Management Offsets – 28 September 2007* will need to be proposed.

(G11) Saline ponds/dams must not be located ***within 50 metres*** of remnant *endangered* and *of concern* regional ecosystems.

MANAGEMENT OF FAUNA

(G12) The holder of this authority must develop and implement a fauna management plan that details how the holder will ensure that petroleum activities are undertaken to minimise the potential risk of causing harm to fauna. The Plan must be developed prior to undertaking the authorised petroleum activities

(G13) The Plan must consider, but not be limited to:

a) the "Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines" dated October 2005 or subsequent versions thereof;
b) practices to prevent fauna entrapment and death in pipeline trenches;
c) practices to prevent fauna entrapment within well heads, borrow pits, drill sumps and evaporation dams;
d) Fauna handling by a suitably qualified person; and
e) Fauna awareness training.

MANAGEMENT OF PEST AND WEED SPECIES

(G14) The holder of this authority must develop a Pest and Weed Management Plan (PWM Plan) to minimise population growth and dispersal of plant and weed species. The Plan must be developed prior to undertaking the authorised petroleum activities.

(G15) The PWM Plan must be consistent with the relevant Regional Council Pest and Weed Management Plan.

(G16) The PWM Plan must address the following matters:

a) Vehicle, plant and equipment inspection procedures;
b) Vehicle, plant and equipment wash down procedures;
c) Operation and maintenance of wash down facilities;

d) Operation and movement of vehicles, plant and equipment throughout the relevant petroleum authority while the authorised petroleum activities are being carried out;
e) Monitoring of pest and weed species;
f) Corrective actions that will be undertaken in the event that new pest and weed species are identified or existing populations proliferate because of the authorised petroleum activities; and
g) The management of pest fauna species.

PROTECTION OF RIVERINE AREAS

(G17) Activities resulting in significant disturbance to the bed or banks of a watercourse or wetland, or a spring must:

a) only be undertaken where necessary for the construction and/or maintenance of roads, tracks and pipelines that are essential for carrying out the authorised petroleum activities and no reasonable alternative location is feasible; and
b) be no greater than the minimum area necessary for the purpose of the significant disturbance; and
c) be designed and undertaken by a suitably qualified and experienced person; and
d) have rehabilitation commence immediately upon cessation of the authorised petroleum activities.

(G18) Erosion and sediment control measures must be implemented to minimise any increase in water turbidity due to carrying out petroleum activities in the bed or banks of a watercourse or wetland, or a spring.

REHABILITATION REQUIREMENTS

(G19) Progressive rehabilitation of disturbed areas must commence as soon as practicable following the completion of any construction or operational works associated with the authorised petroleum activities on the relevant petroleum authority.

(G20) As soon as practicable and within 3 months of cessation of petroleum activities that cause any significant disturbance to land, the holder of this authority must:

a) investigate contaminated land status in accordance with *Environmental Protection Act 1994* requirements and the National Environment Protection (Site Assessment) Measure 1999 (NEPM) where land has been subject to contamination caused by petroleum activities authorised under this authority; and,
b) on all significantly disturbed land, take all reasonable and practicable measures to:
    i. re-establish surface drainage lines; and
    ii. reinstate the top layer of the soil profile; and
    iii. promote the re-establishment of vegetation.

(G21) All land significantly disturbed by petroleum activities must be rehabilitated to:

a) a stable landform with a self-sustaining vegetation cover with same species and density of cover to that of the surrounding undisturbed areas;
b) ensure that all land is reinstated to the pre-disturbed land use and suitability class;
c) ensure that the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance by petroleum activities; and
d) ensure that the water quality of any residual void or water bodies constructed by petroleum activities meets criteria for subsequent uses and does not have potential to cause environmental harm.

(G22) Maintenance of rehabilitated areas must take place to ensure and demonstrate:

a) stability of landforms;
b) erosion control measures remain effective;
c) stormwater runoff and seepage from rehabilitated areas does not negatively affect the environmental values of any waters;
d) plants show healthy growth and recruitment is occurring; and
e) rehabilitated areas are free of any declared pest plants.

(G23) Rehabilitation can be considered successful when the site can be managed for its designated land-use (either similar to that of surrounding undisturbed areas or as otherwise agreed in a written document with the landowner/holder and administering authority) without any greater management input than for other land in the area being used for a similar purpose and there is evidence that the rehabilitation has been successful for at least 3 years.

SCHEDULE H SEWAGE TREATMENT AND EFFLUENT MANAGEMENT

(H1) The holder of this authority must develop and submit to the administering authority a Sewage Effluent Management Plan for the proposed sewage treatment systems. The Sewage Effluent Management Plan must address the following matters:

a) identification of environmental issues and potential impacts.
b) control measures for routine operations to minimise likelihood of environmental harm.
c) contingency plans and emergency procedures for non-routine situations.
d) organisational structure and responsibility.
e) effective communication.
f) monitoring of contaminant releases.
g) conducting environmental impact assessments,
h) staff training.
i) record keeping.
j) periodic review of environmental performance and continual improvement.

(H2) The Sewage Effluent Management Plan must not be implemented or amended in a way that contravenes any condition of this authority.

IRRIGATION OF TREATED SEWAGE EFFLUENT

(H3) Subject to Condition (H4), the holder of this authority may use Class C treated effluent for irrigation provided that:

a) the systems are designed by a professional with experience in the design and deployment of treated sewage effluent irrigation systems;
b) records of system performance are maintained; and
c) no spray drift or overspray occurs at any sensitive or commercial place.

(H4) The treated effluent from the sewage treatment plant must only be released to land at designated irrigation areas as determined in the Sewage Effluent Management Plan in compliance with the limits stated in Schedule H – Table 1.

Schedule IH– Table 1 Contaminant release limits to land

Quality Characteristics	Units	Release Limit
Biological Oxygen Demand	mg/L	20 (maximum)
pH	scale	6.0 – 8.5 (range)
EC	µs/cm	<1600
Total Dissolved Solids	mg/L	<1000
Total Suspended Solids	mg/L	30 (maximum)
E. coli (coliform forming units/100ml)	Colony forming units/100mL	<1000 (maximum)
Total Nitrogen	mg/L	35 (Maximum)
Total Phosphorous	mg/L	10 (Maximum)
Dissolved Oxygen	mg/L	2 (Minimum)

(H5) Notwithstanding the quality characteristics limits specified in Schedule I – Table 1 Contaminant release limits to land, releases of treated sewage effluent must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm.

(H6) Monitoring must be undertaken at the frequency specified under the Sewage Effluent Management Plan and records kept of contaminant releases to land for the parameters specified in Schedule H– Table 1 Contaminant release limits to land. All determinations of the quality of contaminants released must be:

a) made in accordance with methods prescribed in the latest edition of the Environmental Protection Agency Water Quality Sampling Manual; and
b) carried out on samples that are representative of the discharge.

MANAGING SEWAGE EFFLUENT FROM MOBILE OR TEMPORARY FACILITIES

(H7) The holder of this authority must ensure that:

a) plant and equipment used for sewage treatment or disposal is installed, maintained and operated in a proper and efficient manner;
b) untreated sewage effluent is not released to waters;
c) sewage effluent is not released to land or waters (including groundwater) other than in accordance with the requirements of the *Queensland Plumbing and Waste Water Code;*
d) any on site septic tanks and associated infrastructure are to be constructed and maintained in accordance with AS1546; and
e) all sewage sludge wastes are removed from the system, transported and disposed of off site by a registered and suitability qualified person.
f) the handling, treatment and disposal of sewage effluent does not cause the contamination of any water used for drinking or domestic purposes or manufacturing purposes or for consumption by animals;
g) where sewage sludge is buried on land the sludge is covered with at least 250mm of soil and where practicable located above known flood levels;
h) surface ponding of effluent on land disposal area(s) is minimised and managed in a way that does not cause nuisance; and

access to any sewage effluent land disposal area is denied during the release of contaminants to the land and until the irrigation/disposal area has dried.

SCHEDULE I STORAGE AND HANDLING OF CHEMICALS, FLAMMABLE AND COMBUSTIBLE SUBSTANCES

(I1) All explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids (including petroleum products and associated piping and infrastructure) must be stored and handled in accordance with the relevant Australian Standard where such is available.

(I2) Notwithstanding the requirements of any Australian Standard, any liquids stored on site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to waters or land. Where no relevant Australian Standard is available, the following must be applied:

a) storage tanks must be bunded so that the capacity and construction of the bund is sufficient to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas; and
b) drum storages must be bunded so that the capacity and construction of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.

(I3) All containment systems must be designed to minimise rainfall collection within the system.

SCHEDULE J EXPLORATION DRILLING, WELL ESTABLISHMENT AND PRODUCTION TESTING ACTIVITIES

(J1) Prior to undertaking drilling activities, the holder of this authority must investigate the location of potential well sites and determine the well lease configuration that would minimise the area of disturbance.

(J2) Subject to Condition (J1), the holder of this authority must be able to demonstrate that the area disturbed by the construction of any well lease is as low as reasonably practicable, and the decision is based upon health and safety requirements and environmental considerations associated with the proposed drilling operations.

(J3) Well lease infrastructure (e.g. cellar pits, turkeys nest dams or drill sumps) must be designed and operated to prevent the entrapment of native fauna or provide habitats for the introduction or spread of noxious pest species.

(J4) Permanent well lease infrastructure must be securely fenced to exclude livestock once the well is operational and within one month of well site activities being completed.

(J5) All waste fluids and muds resulting from drilling activities must be contained in a dam or containment structure until they are disposed of or reused where applicable.

(J6) Oil based drilling muds are not authorised to be used under this authority.

(J7) Production testing of coal seam gas wells must be restricted to determining the feasibility of gas reserves within a specific pilot program and be undertaken in accordance with the following conditions:

a) Production test dams must be appropriately lined (using either a synthetic or clay liner) and be built in accordance with Schedule O - Dams.
b) Production test dams must be decommissioned and rehabilitated within 12 months of cessation of production test activities, unless a longer period as agreed to with the Administering Authority.
c) Production test dams must be restricted to the minimum size required to adequately determine gas reserves unless otherwise submitted under Condition (N10)and:
    i. be no larger than 5 ha; and
    ii. have a capacity of no greater then 200ML volume.
d) After cessation of production test activities, produced water must be managed in accordance with the Associated Water Management Plan.

(J8) Notwithstanding condition (J7) b), the holder can apply to the administering authority to enable the dams be used for further production testing activities for other pilot programs.

(J9) The holder of this authority must decommission all dams or sumps associated with the drilling operations by:

a) Removing all remaining liquids;
b) Removing synthetic liners if used and disposing of them at a facility licensed to accept such waste material;
c) Removing all contaminated solids and / or contaminated subsoils (where applicable) and:
    i. disposing of the contaminated solids at a facility licensed to accept such regulated waste; or
    ii. encapsulate in a purpose built storage facility that has been:
        a. designed by a suitably qualified and experienced person; and
        b. has been certified that that the design of the facility is fit for the purpose and is compliant in all respects with this authority.

d) If required, remove the dam wall and rehabilitate the disturbed area in accordance with the rehabilitation conditions of this authority.

(J10) Within 3 months of the cessation of drilling / completion activities, drill sumps and flare pits are to be at least be rehabilitated to a standard whereby the sump/pit has been filled, contoured and revegetation has begun.

(J11) After the cessation of drilling / well completion activities, the well lease area must be rehabilitated to a state where the site is stabilised and vegetation has been established while maintaining necessary exclusion zones for health and safety matters or future well maintenance activities.

SCHEDULE K ENVIRONMENTALLY SENSITIVE AREAS

(K1) Not withstanding any other condition of this authority, the holder of this authority must ensure that petroleum activities:

a) are not conducted within a category A or B Environmentally Sensitive Area (ESA); and
b) do not cause a significant disturbance within 1km of a category A ESA or within 500m of a category B ESA; and
c) are not conducted in a category C ESA unless there is a written agreement to enter the area for those activities from the relevant administering authority.

(K2) Prior to carrying out field based activities, the holder of the environmental authority should make all relevant staff, contractors or agents carrying out those activities, aware of the location of any category A, B or C environmentally sensitive areas within area of the proposed activity.

(K3) Despite condition (K1), where no reasonable alternative exists, petroleum activities may be undertaken within an endangered regional ecosystem or the 500m buffer zone of an endangered regional ecosystem, provided that those activities are located according to the following order of preference:

a) pre-existing areas of significant disturbance within the buffer zone;
b) undisturbed areas more than 100m from the ESA;
c) undisturbed areas less than 100m from the ESA;
d) pre-existing areas of significant disturbance within the ESA;
e) areas within the ESA of lower environmental value (eg. not of concern remnant vegetation or of concern remnant vegetation in a polygon mapped as containing endangered regional ecosystem and other ecosystems); and
f) areas where clearing of an endangered regional ecosystem is unavoidable provided the clearing does not exceed 10 % of a polygon mapped as an endangered regional ecosystem and all reasonable effort is made to minimise the area cleared and to avoid clearing mature trees.

(K4) Condition (K3) does not authorise clearing that is:

a) more than 10 % of a polygon mapped as an endangered regional ecosystem;
b) more than 3600m^2 for the operational area for any drill site within an endangered regional ecosystem;
c) Within an endangered regional ecosystem for construction of a sump larger than 30m^2;
d) greater than 6 metres in width for tracks that are necessary within an endangered regional ecosystem for production and exploration purposes; and
e) greater than 12 metres in width for pipeline construction purposes that is necessary within an endangered regional ecosystem.

SCHEDULE L DECLARED WILD RIVER AREAS

(L1) The holder of this authority must ensure that any petroleum activities carried out within a wild river area comply with the conditions stated in the relevant wild river declaration for that area.

SCHEDULE M PETROLEUM INFRASTRUCTURE

MANAGEMENT OF WATER EXTRACTED FROM LOW POINT DRAINS

(M1) Water extracted from low point drains may be released to land providing that the water quality does not exceed the water quality limits set in Schedule M - Table 1 and that the release is carried out in a manner that ensures that:

a) vegetation is not damaged;
b) soil erosion and soil structure damage is avoided;
c) the quality of groundwater is not adversely affected;
d) discharge of low point drain water will be controlled so that there is no water runoff from the nominated discharge areas; and
e) there are no releases of low point drain water to any surface waters.

Schedule M - Table 1 - Limits for the Disposal of water extracted from low point drains to Land

Parameter	Value
pH	6.5-8.5 (Range)
Arsenic (mg/L)	2.0 (Maximum)
Cadmium (mg/L)	0.05 (Maximum)
Chromium (mg/L)	1 (Maximum)
Copper (mg/L)	5 (Maximum)
Iron (mg/L)	10 (Maximum)
Lead (mg/L)	5 (Maximum)
Manganese (mg/L)	10 (Maximum)
Zinc (mg/L)	5 (Maximum)
Nitrogen (mg/L)	25 (Maximum)
Phosphorus (mg/L)	0.08 (Maximum)
Electrical Conductivity (uS/cm)	2000 (Maximum)

(M2) Not withstanding any other condition of this authority, the holder of this authority must ensure that water from low point drains to be released to land for disposal, does not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm. If the water quality is not suitable for release, then it must be collected and disposed of at appropriate facility.

EMERGENCY RESPONSE PLANS FOR DEALING WITH INCIDENCES THAT MAY RESULT IN ENVIRONMENTAL HARM

(M3) The holder of this authority must ensure that relevant personnel shall be trained and competent to effectively fulfill their roles required as detailed in the relevant Emergency Response Plans to deal with incidents that could potentially result in environmental harm. Training records are to be kept for five years.

(M4) Subject to Condition (M3), the holder of this authority must undertake emergency exercises to:

a) Test the effectiveness of emergency response plan;
b) Validate the competency of key emergency response personnel;
c) Assess capability of to respond to an emergency;

d) Reinforce prior training; and
e) Identify opportunities for improvement.

Emergency response exercises may be in the form of simulated emergencies, practical drills, desktop exercises, resources and equipment checks, or other exercises designed to systematically include all personnel likely to be involved.

(M5) Subject to Condition (M4), the holder of this authority must notify the administering authority in writing at least ten (10) business days prior to conducting emergency response exercise. The holder of this authority must also telephone the EPA's Pollution Hotline (1300 130 372) or local office the day during the emergency response exercise.

SCHEDULE N DAMS

ALL DAMS

(N1) The holder of this environmental authority must not construct or operate more than 800 hectares of land in total used for evaporation ponds under this environmental authority.

(N2) The holder of this authority must ensure that regulated dams constructed from the date of issue of this environmental authority are designed and constructed by a suitably qualified engineer. All dams must be operated and maintained in accordance with generally accepted engineering standards and practices.

(N3) The hazard category of each dam must be assessed by a suitably qualified and experienced person at least once per year, based on documented evidence sufficient to define or confirm the current nature and extent of environmental consequences for potential failure of that dam.

(N4) Dams having a hazard category assessed as significant or high, must be specifically authorized by an environmental authority.

(N5) The holder of this environmental authority must not abandon any dam but must decommission each dam so as to avoid any environmental harm.

(N6) As a minimum, decommissioning must be conducted such that each dam is either:

a) Converted to a stable landform, that no longer contains flowable substances, or
b) approved or authorised under relevant legislation for a beneficial use, or
c) is a void authorised by the administering authority to remain after decommissioning; and,
d) compliant with the rehabilitation requirements of this environmental authority.

REGULATED DAMS - LOCATION

(N7) The following regulated dams authorised under this environmental authority must be located within the control points defined in Schedule N - Table 1, below.

Schedule N — Table 1 (Location of Regulated Dams)

Name of Regulated Dam	Latitude (N) (GDA 94)	Longitude (E) (GDA 94)
Kenya Pond	-26.948389 -26.949163 -26.957721 -26.956745	150.441500 150.453654 150.453292 150.441143
Wambo Downs 1	-26.843544 -26.843708 -26.844756 -26.844478	150.480136 150.481742 150.480783 150.479360
Wambo Downs 2	-26.848898 -26.846970 -26.847142 -26.848960	150.482311 150.482514 150.484563 150.484281

Name of Regulated Dam	Latitude (N) (GDA 94)	Longitude (E) (GDA 94)
Rhynie Pond	-26.943560 -26.946991 -26.958258 -26.957800 -26.953400 -26.943911	150.462543 150.469488 150.467065 150.460751 150.469641 150.461799

(N8) The following regulated dams authorised under this environmental authority, must be in accordance with the specifications in Schedule N - Table 2, below.

Schedule N— Table 2 (Specifications of Regulated Dams)

Name of Regulated dam	Hazard Category	Maximum surface area of dam (ha)	Maximum operational volume of dam (ML)	Maximum depth of dam (m)	Use of dam
Kenya Pond	High	90	2,800,000	6.7	Evaporation
Wambo Downs 1	Not yet assessed	0.07	1750	2.5	Evaporation
Wambo Downs 2	Not yet assessed	0.06	8550	14.25	Evaporation
Rhynie Pond	High	117.5	3,600,000	12.2	Evaporation

(N9) The following regulated dams authorised under this environmental authority, must provide the hydraulic performance specified in Schedule N - Table 3, below.

Schedule N — Table 3 (Hydraulic Performance of Regulated Dams)

Name of Regulated dam	Spillway Capacity or Diversion Capacity (Levees) AEP	Design Storage Allowance (Dams other than levees) AEP (m^3)	Mandatory Reporting Level (Dams other than levees) AEP
Kenya Pond	13 m^3/s at an expected discharge frequency 1:100 year.	3530	307
Wambo Downs 1	No spillway	2	303
Wambo Downs 2*	N/A	N/A	N/A
Rhynie Pond	9.5 m^3/s 1:25 000 year return frequency. Expected discharge frequency 1:100 year.	3420	311.4

NOTE: For each entry in the table for Design Storage Allowances, the method of calculation (either 'full hydrological analysis' or 'method of monthly deciles') must be specified in conjunction with the AEP level applicable to the hazard category and method of calculation - as indicated in the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams, maintained and published by the Environmental Protection Agency on its website.
* Wambo Downs Pond 2 has been dismantled.

REGULATED DAMS – CERTIFICATION AND OPERATION

(N10) The holder of this environmental authority must not commence construction of a regulated dam unless:

a) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam will deliver the performance stated in the design plan and that it will be compliant in all respects with this environmental authority, and
b) at least 20 business days has passed since the receipt of those documents, or the administering authority notifies the holder that a design plan and certification, has been received.

(N11) When construction or modification of any regulated dam is complete, or when a dam becomes a regulated dam due to changes in the circumstances affecting a hazard assessment for that dam; the holder of this environmental authority must submit to the administering authority two copies of a set of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the certification and it is compliant in all respects with this environmental authority.

(N12) An operational plan must be kept current for each regulated dam, and cover all matters relevant to its operation and maintenance.

(N13) Where an operational plan covers decommissioning and rehabilitation, those operations are to be consistent with the objectives in any design plan for the dam and the rehabilitation requirements of this environmental authority.

(N14) The holder of this environmental authority must notify the administering authority immediately when the level in any regulated dam reaches the mandatory reporting level (MRL), and immediately act to prevent or minimise any actual or potential environmental harm.

REGULATED DAMS – ANNUAL INSPECTION AND REPORT

(N15) Each regulated dam must be inspected annually by a suitably qualified and experienced person.

(N16) At each annual inspection, the condition and adequacy of each regulated dam must be assessed for dam safety and against the necessary structural, geotechnical and hydraulic performance criteria.

(N17) At each annual inspection, if a mandatory reporting level is required, it must be determined and marked on each regulated dam.

(N18) A final assessment of adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October and result in an estimate of the level in that dam as at 1 November

(N19) For each annual inspection, two copies of a report on the condition and adequacy of each regulated dam, certified by the suitably qualified and experienced person and including any recommended actions to be taken to ensure the integrity of each regulated dam; must be provided to the administering authority by 1 December.

(N20) The holder of this environmental authority must, upon receipt of the annual inspection report, consider the report and its recommendations, and take action to ensure that each regulated dam safely performs its intended functions.

DECOMMISSIONING REGULATED DAMS

(N21) Prior to decommissioning any regulated dam authorised under this authority, the scope of work for decommissioning shall be developed and agreed to with the administering authority.

(N22) Subject to condition (N21), the holder of this authority must:

a) Remove all remaining liquids in the dam.
b) Remove and dispose of synthetic liners and dispose at a facility licensed to accept such waste material;
c) Remove where possible all contaminated solids from the dam including contaminated subsoils and:
   i. dispose of the contaminated solids at a facility licensed to accept such regulated waste; or
   ii. encapsulate in a purpose built storage facility.
d) Design, install and maintain adequate diversion drains or similar structures to protect or minimise the erosion of any exposed surfaces by stormwater runoff.
e) Design, install and maintain adequate surface drainage to prevent water ponding and infiltration into any contaminated materials.
f) Address any contaminated site issues in accordance with Condition (G20).
g) Establish a monitoring program to determine the success of the decommissioning plan.
h) If required, remove the wall and rehabilitate the disturbed area in accordance with the rehabilitation conditions of this authority.
   i) Rehabilitate the disturbed areas in accordance with the rehabilitation conditions of this authority.

EXISTING EVAPORATION PONDS

(N23) The holder of the environmental authority must ensure that all existing evaporation ponds are catalogued on a pond register, within 6 months of the issue of the environmental authority, which must be made available to the administering authority upon request. Details to record, as a minimum, include:

- location of each corner of the evaporation pond (Geographical Information System, GDA 94);
- location of evaporation pond in relation to a water body;
- size of evaporation pond (hectares);
- capacity (ML);
- quality of water contained in the pond (pH, Electrical Conductivity and dissolved sodium, magnesium, potassium, calcium, sulfate, bicarbonate, chloride);
- environmental impact risk analysis, including procedures and structures that are in place to minimise or prevent ground water and land contamination;
- ground water and soil monitoring methodology in place, including field and laboratory procedures;
- signs of water seepage or leakage should be investigated and status of each pond catalogued on the pond register should be recorded and kept on file until requested by the administering authority;
- maintenance procedural methodology
- indicators of land/ground water salinisation must be investigated for each existing evaporation pond and the status for each pond should be recorded and kept on file until requested by the administering authority.

SCHEDULE O COMPRESSION FACILITIES

FUEL BURNING

(O1) The release of contaminants to the atmosphere from a point source must only occur from those release points identified in Schedule O – Table 1 and must be directed vertically upwards without any impedance or hindrance.

(O2) Contaminants must be released to the atmosphere from a release point at a height and flow rate not less than the corresponding height and velocity stated for that release point stated in Schedule O – Table 1.

Schedule O – Table 1- Compressor Station Release Points

Release Source	Minimum release height (metres)	Minimum velocity (m/sec)	Contaminant release
Kenya Field Compression Station			
Natural Gas Engines Kenya 1 to Kenya 4	7m	59 m/s	At 100% load and speed: NO_x 1.91 kg/hr CO 1.5 kg/hr Hydrocarbons 3.3 kg/hr
Natural Gas Engines Kenya 5 to Kenya 8	7m	59 m/s	At 100% load and speed: NO_x 1.91 kg/hr CO 1.5 kg/hr Hydrocarbons 3.3 kg/hr
Start and blow down vents	3m		Approx 30m3 coal seam gas (>97% CH4, 2.6% N, 0.1% CO2, <0.15% C2H6)
Codie Field Compression Station			
Natural Gas Engines Codie 1 to Codie 8	7m	59 m/s	At 100% load and speed: NO_x 1.91 kg/hr CO 1.5 kg/hr Hydrocarbons 3.3 kg/hr
Kenya Processing Plant			
Natural Gas Engines Kenya Sales 1 to Kenya Sales 10	3.5 metres above ground level	42 m/s	At 100% load and speed: NOx 16.02ton/year CO 57.23 ton/year Hydrocarbons 9.15 ton/year

(O3) The only type of fuel to be burnt in the compressors, under normal operating conditions, is coal seam gas.

MONITORING OF CONTAMINANT RELEASES TO THE ATMOSPHERE

(O4) When requested by the administering Authority, contaminant monitoring and recording must be undertaken to investigate any complaint, and the results notified with 14 days to the Administering Authority.

(O5) All determinations of air contaminant releases to the atmosphere must be made in accordance with the methods prescribed in the most recent version of the Environmental Protection Agency's Air Quality Sampling Manual. If monitoring requirements for specific contaminants are not described in the Environmental Protection Agency's Air Quality Sampling Manual, monitoring protocols must be in accordance with a method as approved by New South Wales EPA, Victorian EPA or United States EPA.

NOISE ASSESSMENT POST CONSTRUCTION

(O6) The holder of this authority must assess noise emissions from the relevant gas compression facilities and, submit a report to the administering authority detailing the results of the noise assessment to confirm compliance with noise limits imposed by Condition (E3). The report must be submitted to the administering authority within 3 months after the petroleum facility has been fully commissioned.

(O7) Subject to Condition (E1), if noise emissions exceed noise emission limits set by Condition (E3), the holder of this authority must implement noise abatement measures to satisfy the requirements of Condition (E3) within 3 months after notifying the administering authority.

SCHEDULE P MONITORING PROGRAMS

(P1) The holder of this authority must:

a) develop and implement a monitoring program that will demonstrate compliance with the conditions in this authority; and
b) document the monitoring and inspections carried out under the program and any actions taken.

(P2) The holder of this authority must ensure that a suitably qualified, experienced and competent person(s) conduct all monitoring required by this authority.

(P3) The holder of this authority must record, compile and keep for a minimum of five years all monitoring results required by this authority and make available for inspection all or any of these records upon request by the administering authority. Monitoring results relating to rehabilitation should be kept until the relevant petroleum tenure is surrendered.

(P4) Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this authority must be reviewed for performance and amended if required on an annual basis.

(P5) An annual monitoring report must be prepared each year and presented to the administering authority when requested. This report shall include but not be limited to:

a) a summary of the previous twelve (12) months monitoring results obtained under any monitoring programs required under this authority and, a comparison of the previous twelve (12) months monitoring results to both this authority limits and to relevant prior results; and
b) an evaluation/explanation of the data from any monitoring programs; and
c) a summary of any record of quantities of releases required to be kept under this authority; and
d) a summary of the record of equipment failures or events recorded for any site under this approval; and
e) an outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs.

SCHEDULE Q COMMUNITY ISSUES

(Q1) When the administering authority advises the holder of a complaint alleging nuisance, the holder must investigate the complaint and advise the administering authority in writing of the action proposed or undertaken in relation to the complaint.

(Q2) When requested by the administering authority, the holder of this authority must undertake monitoring specified by the administering authority, within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint of environmental harm at any sensitive or commercial place.

(Q3) The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures implemented must be provided to the administering authority within fourteen (14) days of completion of the investigation, or receipt of monitoring results, whichever is the latter.

(Q4) If monitoring in accordance with Condition (Q2), indicates that emissions exceed the limits set by this authority or are causing nuisance, then the holder of this authority must:

a) address the complaint including the use of appropriate dispute resolution if required; and/or
b) as soon as practicable implement abatement or attenuation measures so that noise, dust, particulate or odour emissions from the authorised activities do not result in further environmental nuisance.

(Q5) Maintain a record of complaints and incidents causing environmental harm, and actions taken in response to the complaint or incident; and

(Q6) The holder of this authority must record the following details for all complaints received and provide this information to the administering authority on request:

a) name, address and contact number for complainant;
b) time and date of complaint;
c) reasons for the complaint;
d) investigations undertaken;
e) conclusions formed;
f) actions taken to resolve complaint;
g) any abatement measures implemented; and
h) person responsible for resolving the complaint.

(Q7) The holder of this authority must retain the record of complaints required by this condition for 5 years.

SCHEDULE R NOTIFICATION PROCEDURES

(R1) The holder of this authority must telephone the EPA's Pollution Hotline (1300 130 372) or local office as soon as practicable after becoming aware of any release of contaminants not in accordance with the conditions of this authority or any event where environmental harm has been caused or may be threatened.

(R2) Subject to Condition (R1), the holder of this authority is required to report in the case of uncontained spills (including hydrocarbon, associated water or mixtures of both) of the following volumes or kind:

a) releases of any volume to water; and
b) releases of volume greater than 200L to land; and
c) releases of any volumes where potential serious or material environmental harm is considered to exist.

(R3) The notification of emergencies or incidents as required by Conditions number (R1 and R2) must include but not be limited to the following:

a) the authority number and name of holder;
b) the name and telephone number of the designated contact person;
c) the location of the emergency or incident;
d) the date and time of the release;
e) the time the holder of the authority became aware of the emergency or incident;
f) the estimated quantity and type of any substances involved in the incident;
g) the actual or potential suspected cause of the release;
h) a description of the effects of the incident including the environmental harm caused, threatened, or suspected to be caused by the release;
i) any sampling conducted or proposed, relevant to the emergency or incident; and
j) actions taken to prevent any further release and mitigate any environmental harm caused by the release.

(R4) Within fourteen (14) days following the initial notification of an emergency or incident or receipt of monitoring results, whichever is the later, further written advice must be provided to the administering authority, including the following:

a) results and interpretation of any samples taken and analysed;
b) outcomes of actions taken at the time to prevent or minimise environmental harm; and
c) proposed actions to prevent a recurrence of the emergency or incident.

(R5) As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this authority, written advice must be provided of the results of any such monitoring performed to the administering authority.

APPENDIX 1 DEFINITIONS

TERM	MEANING
Acceptance criteria	Means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the environmentally relevant activities. Acceptance criteria may include information regarding: • stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage; • control of geochemical and contaminant transport processes; • quality of runoff waters and potential impact on receiving environment; • vegetation establishment, survival and succession; • vegetation productivity, sustained growth and structure development; • fauna colonisation and habitat development; • ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes; • microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration; • effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development; • resilience of vegetation to disease, insect attack, drought and fire; • vegetation water use and effects on ground water levels and catchment yields.
Accepted engineering standards	In relation to dams, means those standards of design, construction, operation and maintenance that are broadly accepted within the profession of engineering as being good practice for the purpose and application being considered. In the case of dams, the most relevant documents would be publications of the Australian National Committee on Large Dams (ANCOLD), guidelines published by Queensland government departments, and relevant Australian and New Zealand Standards.
Administering authority	Administering authority means - (a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994* – the local government; or (b) for all other matters – the Chief Executive of the Environmental Protection Agency; or (c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.
AEP	Means the Annual Exceedance Probability, which is the probability that at least one event in excess of a particular magnitude will occur in any given year.
Assessable vegetation	Means vegetation in which clearing is assessable development under Schedule 8, Part 1, Table 4, Items 1A-1G of the *Integrated Planning Act 1997*

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Assessment, assessed or assess	By a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time: (a) exactly what has been assessed and the precise nature of that assessment; (b) the relevant legislative, regulatory and technical criteria on which the assessment has been based; (c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and (d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.
Associated water	Underground water taken from or interfered with from a petroleum well during the course of or resulting from carrying out petroleum activities. Associated water may be potable or suitable for stock purposes, or saline, high in fluoride, contain hydrocarbons, and/or is otherwise contaminated by a hazardous contaminant. It may be classified as a hazardous waste.
Associated works	In relation to a dam, means: (a) operations of any kind and all things constructed, erected or installed for that dam; and (b) any land used for those operations.
AS 2885	Australian Standard Pipelines – Gas and Liquid Petroleum (2007 or subsequent versions thereof)
Authority	Means an environmental authority granted in relation to an environmentally relevant activity under the *Environmental Protection Act 1994*.
Background noise level	Background noise level $L_{A90,15mIn}$ means the A-weighted sound pressure level of the residual noise exceeded for 90% of a representative time period of not less than 15 minutes, using time weighting, 'F'.
Beneficial use	in respect of dams means that the current or proposed owner of the land on which a dam stands, has found a use for that dam that is: (a) of benefit to that owner in that it adds real value to their business or to the general community, (b) in accordance with relevant provisions of the *Environmental Protection Act 1994*, (c) sustainable by virtue of written undertakings given by that owner to maintain that dam, and the transfer and use have been approved or authorised under any relevant legislation.
Certification or certified	By a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time: (a) exactly what is being certified and the precise nature of that certification. (b) the relevant legislative, regulatory and technical criteria on which the certification has been based; (c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant

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	data and facts; and (d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.
Competent person	A person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.
Commercial place	A work place used as an office or for business or commercial purposes, which is not part of the petroleum activity and does not include employees' accommodation or public roads.
Construction	Includes building a new dam or pipeline and modifying or lifting an existing dam or pipeline.
Contaminant	The *Environmental Protection Act 1994* defines, under Section 11, a contaminant as: (a) a gas, liquid or solid; or (b) an odour; or (c) an organism (whether alive or dead), including a virus; or (d) energy, including noise, heat, radioactivity and electromagnetic radiation; or (e) a combination of contaminants.
Dam	Means a land-based structure or a void that is designed to contain, divert or control flowable substances and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. However; a dam does *not* mean a fabricated or manufactured tank or container designed to a recognised standard, *nor* does a dam mean a land-based structure where that structure is designed to an Australian Standard. In case there is any doubt, a levee (dyke or bund) is a dam, but (for example) a bund designed for spill containment to AS1940 is *not* a dam.
Design plan	Is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a 'suitable qualified and experience person' could conduct an independent review without seeking further information from the designer.
Design storage allowance or DSA	Means the minimum storage required in a dam at 1 November each year in order to meet the hydraulic performance requirements.
Discharge area	Discharge area is: (a) that part of the land surface where groundwater discharge produces a net movement of water out of the groundwater; and (b) identified by an assessment process consistent with the document: Salinity Management Handbook, Queensland Department of Natural Resources, 1997; or (c) identified by an approved salinity hazard map held by the Department of Natural Resources, Mines and Water.
Dispersible soils	Soils in which clay material disintegrates into particles less than 2 microns across. This can be observed within 24 hours when soil crumbs are submerged

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	in distilled water.
Dissects corridors	Dissects corridors of vegetation means clearing vegetation that results in a break more than 50 metres wide across a corridor.
Environmental Management Plan	The environmental management plan is an environmental management document to be submitted during the application process for a level 1 environmental authority (petroleum activities).
Environmental nuisance	Environmental nuisance is unreasonable interference or likely interference with an environmental value caused by: (a) noise, dust, odour, light; or (b) an unhealthy, offensive or unsightly condition because of contamination; or (c) another way prescribed by regulation.
Environmentally sensitive area	Environmentally sensitive area (as determined from the EPA GIS data base) means a location, however large or small, that has environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical or cultural heritage value, or are important in providing amenity, harmony or sense of community.
Financial assurance	A security deposit, either cash or a bank guarantee, held by the administering authority to cover the potential costs of rehabilitating areas significantly disturbed by the petroleum activities.
Flowable substance	Means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.
Foreseeable future	Is the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable probability of failure before that time.
Groundwater	Groundwater means subsurface water, generally saturating the soil or rock in which it occurs.
Hazard	In relation to a dam as defined in this authority, means the potential for environmental harm resulting from the collapse, or failure of the dam to perform its primary purpose of containing, diverting or controlling flowable substances.
Hazardous contaminant	A contaminant that, if improperly treated, stored, disposed of or otherwise managed, is likely to cause serious or material environmental harm because of: (a) its quantity, concentration, acute or chronic toxic effects, carcinogenicity, teratogenicity, mutagenicity, corrosiveness, explosiveness, radioactivity or flammability; or (b) its physical, chemical or infectious characteristics.
Hazard category	Means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (Version 1.0, 2008) published by the Environmental Protection Agency on its website and attached in Appendix 5.
Hydraulic performance	Means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the

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	relevant hazard category in the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Environmental Protection Agency.
Infrastructure	Means water storage dams, roads and tracks, buildings and other structures built for the purpose and duration of the conduct the petroleum activities, but does not include other facilities required for the long term management of the impact of those activities or the protection of potential resources. Such other facilities include dams other than water storage dams, waste dumps, voids, or stockpiles and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.
Levee	Means a dyke or bund that is designed only to provide for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from unplanned releases from other works of infrastructure, during the progress of those stormwater or flood flows or those unplanned releases; and does not store any significant volume of water or flowable substances at any other times.
Licensed waste disposal facility	A facility approved under a development approval and operated by a holder of a registration certificate for environmentally relevant activity item number 75 under Schedule 1 of the *Environmental Protection Regulation 1998*.
$L_{A\ max,\ adj,\ T}$	$L_{A\ max,\ adj,\ T}$ is the adjusted average maximum A-weighted sound pressure level measured over a time period T. The maxima must be measured on a sound level meter with a frequency-weighting that corresponds to perceived loudness ("A" weighting) and the meter must be set to the "fast" response time-weighting. The measured values are to be adjusted upwards by 2 dB(A) to 5 dB(A) if the noise source has tonal characteristics. The measuring period must be in excess of five minutes. The arithmetic average of the adjusted maxima, after eliminating any extraneous noise peaks, is the measure used to characterise the noise environment. (This measure will generally be similar to a percent exceedance of 10% or less. Refer to Australian Standard AS1055.)
Lake	A natural or artificial body of water, either permanent or intermittent.
Land degradation	Land degradation includes the following: (a) soil erosion; (b) rising water tables; (c) the expression of salinity; (d) mass movement by gravity of soil or rock; (e) stream bank instability; and (f) a process that results in declining water quality.
Land use	Term to describe the selected final use of the land, which is planned to occur after the cessation of petroleum operations.
Level 2 petroleum activity	A Level 2 petroleum activity is a petroleum activity that, under section 20(1) of the EP Act is prescribed as a level 2 environmentally relevant activity.
Level 1 petroleum activity	A Level 1 petroleum activity is a petroleum activity that, under section 20(1) of the EP Act is prescribed as a Level 1 environmentally relevant activity.
Mandatory reporting level or MRL	Means a warning and reporting level determined in accordance with the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Environmental Protection Agency.

TERM	MEANING
NATA	National Association of Testing Authorities.
Noise	Noise means a sound or vibration of any frequency, whether transmitted through air or any other physical medium.
Operational land	Means the land associated with the petroleum project for which this authority has been issued.
Petroleum activities	Petroleum activities means activities authorised to take place on land subject to a petroleum authority, including rehabilitation and decommissioning activities.
Petroleum authority	A petroleum authority is— (a) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; or (b) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; or (c) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*.
Petroleum project	A petroleum project is all activities carried out, or proposed to be carred out, under 1 or more of the following, in any combination, as a single integrated operation— (a) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; (b) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; (c) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*
Petroleum works site	A separate location on the area subject to a petroleum authority where petroleum activities are undertaken (e.g. a well site, seismic survey line, camp site, compressor site, evaporation pond etc).
Potential discharge area	Low lying parts of the landscape (relative to adjacent terrain) where groundwater movements are within 2-5m of the land surface and the landscape may be subject to upward movement of groundwater in the future.
Protected area	A protected area under the *Nature Conservation Act 1992*; or • a marine park under the *Marine Parks Act 1992*; or • a World Heritage Area.
Progressive rehabilitation	Rehabilitation (defined below) undertaken progressively or as a staged approach to rehabilitation as petroleum operations are ongoing.
Regulated dam	Means any dam in the significant or high hazard category as assessed using the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Environmental Protection Agency.
Regulated waste	A non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 1998* (whether or not it has been treated or immobilised), and includes — (a) for an element—any chemical compound containing the element; and (b) anything that has contained the waste.
Rehabilitation	The process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental

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	authority and, where relevant, includes remediation of contaminated land.
Representative	A sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the petroleum activities.
Regulated dam	Means any dam in the significant or high hazard category as defined above.
Riverine area	Refers to the land confined to the flood flow channel of a watercourse.
Salinisation	Means the process of salts accumulating in soils or waters.
Sedimentation pond	A bunded or excavated structure used to contain and settle waterborne sediment running off disturbed areas.
Self sustaining	An area of land that has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.
Sensitive place	Sensitive place means any of the following places – (a) a dwelling; (b) a library, childcare centre, kindergarten, school, college, university or other educational institution; (c) a hospital, surgery or other medical institution; (d) a protected area or an area identified under a conservation plan as a critical habitat or an area of major interest, under the *Nature Conservation Act 1992*; (e) a marine park under the *Marine Parks Act 1982*; and (f) a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment).
Sewage	Sewage is the effluent discharged from a sanitary appliance (i.e. sewage treatment works).
Significantly disturbed land	Significantly disturbed land and significant disturbance means land if: (a) it is contaminated land; or (b) it has been disturbed and human intervention is needed to rehabilitate it: i. to a state required under the relevant environmental authority; or ii. if the environmental authority does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance. Examples of a disturbance to land: (a) areas where soil has been compacted, removed, covered, exposed or stockpiled; (b) areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (c) areas where land use suitability or capability has been diminished; (d) areas within a watercourse, waterway, wetland or lake where petroleum activities occur and human intervention is necessary to restore or stabilise the disturbed area; (e) areas submerged by hazardous waste storage and dam walls in all cases; (f) areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after petroleum activities have ceased; or (g) areas where land has become contaminated land and a suitability statement has not been issued.

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	However, the following areas are not significantly disturbed: (a) areas off the petroleum authority (e.g. roads or tracks which provide access to the petroleum authority); (b) areas previously significantly disturbed which have been rehabilitated to the administering authority's satisfaction; (c) areas under permanent infrastructure; (d) areas that were significantly disturbed prior to the grant of the environmental authority, unless those areas are re-disturbed by the holder of the environmental authority during the term of the authority; (e) minor disturbances such as drill sumps and minor respreading of soil on GPS located seismic lines.
Significant wetland	Means the area of land that supports plants or is associated with plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle and that is— a) a regional ecosystem listed in Table 14 and the area on the ground represented as a swamp, lake, marsh, waterhole, wetland, billabong, pool, spring or like, on the most recent 1:250 000 Geoscience Australia topographic map of the area; or b) a Ramsar wetland.
Spillway	Means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.
Stable	Means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.
Suitably qualified and experienced person for dams	Means one who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 1988*, OR registered as a National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act, in these 'relevant fields': (a) knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and (b) at least a total of five years of suitable experience and demonstrated expertise in at least four of the following areas: • investigation, design or construction of dams; • operation and maintenance of dams; • geomechanics with particular emphasis stability, geology and geochemistry; • hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology; • hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes; and • hydrogeology with particular reference to seepage, groundwater, • solute transport processes and monitoring thereof; and • dam safety
Suitably qualified and experienced	Means one who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 1988*, OR registered as a

TERM	MEANING
person for pipelines	National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act, in these 'relevant fields' of designing, constructing, operating and decommissioning high pressure petroleum pipelines.
Tolerable limits	Means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation.
Top layer	The surface layer of a soil profile, which is usually more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from natural surface.
Void	Means any man-made, open excavation in the ground.
Watercourse	Mean the area of land between the high banks of a natural channel—whether artificially improved or not—in which water flows permanently or intermittently, and that is represented as— (a) a creek, stream, river or watercourse on the most recent 1:100 000 Geoscience Australia topographic map; or (b) a creek, stream, river or watercourse on the most recent 1:250 000 Geoscience Australia topographic map in areas where there is no 1:100 000 Geoscience Australia topographic map available.
Waters	Waters includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea) or any part-thereof, stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.
Waterway	A naturally occurring feature where surface water runoff normally collects, such as a clearly defined swale or gully, but only flows in response to a local rainfall event.
Wetland	Means the area of land that supports plants or is associated with plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle, and that is— (a) a regional ecosystem listed in Table 14; or (b) the area on the ground represented as a swamp, lake, marsh, waterhole, wetland, billabong, pool, spring or like, on the most recent — 1:100 000 Geoscience Australia topographic map of the area; or 1:250 000 Geoscience Australia topographic map, in areas where there is no 1:100 000 Geoscience Australia topographic map available; or (c) listed as an 'active' spring in the Queensland Springs Database, which can be accessed at the following internet address: http://www.epa.qld.gov.au/nature_conservation/habitats/wetlands/springs/
Wild river areas	Wild river areas are defined in the *Wild Rivers Act 2005* and may include the following– (a) high preservation areas; (b) preservation areas; (c) floodplain management areas; (d) subartesian management areas.

APPENDIX 2 ENVIRONMENTALLY SENSITIVE AREAS

Category A and B environmentally sensitive areas

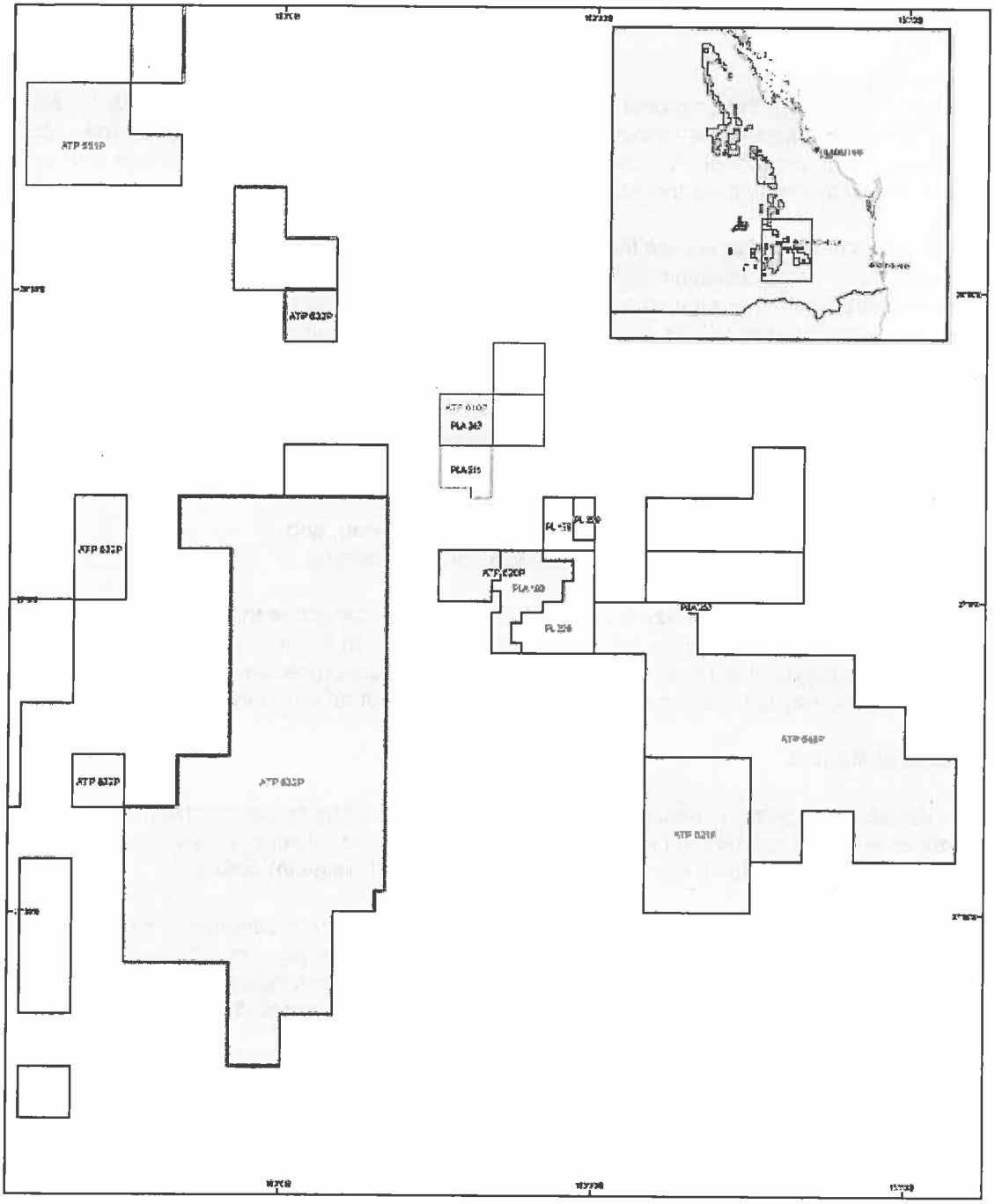
Category A and B environmentally sensitive areas are listed in Section 25 and 26 respectively of the *Environmental Protection Regulation 2008.*

Category C environmentally sensitive areas

LAND AREA CLASSIFICATION	ADMINISTERING LEGISLATION	ADMINISTERING AUTHORITY
• Nature Refuges and Resource Reserves	*Nature Conservation Act 1992*	EPA
• Declared Catchment Areas; • Declared Irrigation and Irrigation Undertaking Areas; • Water Reservoirs and Drainage Areas.	*Water Act 2000 and various Water Board Acts*	NR&M and/ or Relevant Storage Operator or Board
• River Improvement Areas	*River Improvement Trust Act 1940*	NR&M and the Relevant River Trust
• The Designated Landscape Area - Stanbroke Pastoral Holding	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	EPA
Areas under Part 5 Division 2 of the Aboriginal Cultural Heritage Act 2003 and Torres Strait Islander Cultural Heritage Act 2003	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	NR&M
• State Forest or Timber Reserves	*Forestry Act 1959*	EPA
• DPI Research Sites	*Nil*	DPI
• Areas of land occupied by the Bureau of Sugar Experiment Stations.	*Sugar Industry Act 1999*	DPI
• Critical Areas and Public Purpose Reserves	*Land Act 1994*	NR&M
• An area subject to a State Planning Policy that the policy declares is in need of environmental protection.	*Integrated Planning Act 1997*	EPA
• Erosion Prone Areas under Coastal Management Plans and Coastal Management Control Districts	*Coastal Protection and Management Act 1995*	EPA
• "Declared Areas"	*Vegetation Management Act 1999*	NR&M
• An area identified as "Essential Habitat" for a species of wildlife listed as endangered, vulnerable, rare, or near threatened under the *Nature Conservation Act 1992*	*Nature Conservation Act 1992*	EPA
• State Wildlife corridor	*Vegetation Management Act 1999*	NR&M

Important Note: Regional ecosystem classification is determined according to the Queensland Herbarium **Biodiversity Status** Classification. Information on ERE's is maintained by the EPA on the Regional Ecosystem Description Database.

APPENDIX 3 MAPS, FIGURES AND APPROVED PLANS



TENEMENTS WITHIN PROJECT EA

PLs within Project EA
ATPs within Project EA
ATPs

A BG Group business

DATA SOURCE:

DATE: 30/03/09 MAP NO: M_00522_01

CREATED BY: CJC REV NO: A

APPENDIX 4 DETERMINING HAZARD CATEGORIES FOR REGULATED DAMS

Manual for Assessing Hazard Categories and Hydraulic Performance of Dams
Version 1.0

Scope of Manual

The Chief Executive of the Environmental Protection Agency, under the *Environmental Protection Act 1994* (the Act) regulates dams associated with environmentally relevant activities to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

This manual is designed to ensure that the standards used for the design, construction, operation, modification and decommissioning of dams are appropriate for the hazards associated with each dam. This is consistent with the requirement under the Act to take all reasonable and practicable steps to protect the environmental values present, and to minimise environmental harm.

Background to Manual

Good practice requires that all dams must be assessed for "dam break" and "failure to contain" hazard potential. Those dams that could have significant or high impacts need to be carefully designed and operated. Hazards are situations where:

- Something exists that could cause environmental harm, and
- An environmental value is present which could be harmed.

The early identification of the hazard potential of a dam is important as this determines the standard of reliability required for construction and operation of the dam. In this manual, the hazard assessment will determine those dams that require documentation of basic design performance and monitoring. Detailed design of a dam may not need to be done prior to the issue of an authority or approval.

Purpose of Manual

This manual is a regulatory document designed to be called up by model conditions for environmental authorities and development approvals and any other relevant regulatory provisions. Together these provisions will regulate dams associated with environmentally relevant activities.

The purpose of this manual is to guide the assessment of the hazard category of all dams, and thereby determine those dams that require documentation of basic design performance and monitoring. This manual does *not* utilise risk (level) or risk (cost) assessment. Dams include levees, bunds and voids, but *not* any bunds designed for spill containment to an Australian Standard, for example AS1940.

Dams may be assessed using this manual into one of three hazard categories: low, significant or high. A suitably qualified and experienced person should review all available information on a dam, including a site inspection if necessary; and determine the appropriate hazard category for each dam. Lodgement of documentation of hazard assessments with the EPA is *only* required as set out in paragraphs below. Site inspection of a dam is at the discretion of the suitably qualified and experienced person conducting the hazard assessment, provided that all relevant aspects have been researched and documented.

While all dams subject to this manual must be assessed by a suitably qualified and experienced person for "dam break" and "failure to contain" hazard potential, dams with man-made embankments over a specified height or minimum volume and contaminant concentrations, cannot be assessed as low hazard.

For dams that are assessed as being in the low hazard category, basic conditions only are provided in model conditions, requiring dam owners to ensure that all their dams are designed and operated in accordance with accepted engineering standards and have an annual hazard assessment.

Dams that are assessed as being in the significant or high hazard category are referred to as 'regulated dams' because certification of design to performance standards by suitably qualified and experienced persons is normally required to be lodged, and certified annual inspections and reports must be provided.

This Manual replaces and supersedes the previously used information sheets 'Determining Dams Containing Hazardous Waste' and 'Managing Dams Containing Hazardous Waste'.

Background to Hazard Assessment based on Failure Event Scenarios

Failure to Contain Hazard

"Failure to contain" hazards are those potential dam failures that are non-flood producing, but the release of contaminants would endanger environmental values including human life. Examples of events include:
Release of contaminated waters from a spillway during stormwater inflow events,
Punctured membrane discharging contaminated process water or tailings,
Releases due to pipe bursts in tailings or process water circuits associated with the dam,
Piping (localised failure) of containment banks or bunds,
Excessive foundation seepage,
Overtopping of tailings dams by superelevation of tailings beaches or blockage of drainage,
Erosion of containment structures around mining waste (decommissioned tailings dams, waste heaps etc.), and
Dust and gas emissions.

Evaluation of the hazard potential on release requires information on the probable chemical nature of the stored material, including rates, volume and concentrations at the time of a possible release. Acidity and metal ions in solutions due to prolonged contact with ore bodies or stored material must also be considered.

Contaminant concentrations in an unplanned release must be estimated based on the contaminant concentration in the dam, basic design parameters such as storage volume, and resulting dilution in the stormwater. A range of less frequent rainfall events of short duration on contributing catchments must be checked. The hazard assessment must consider the interaction of any failure of a dam with all other dams, on project sites having multiple dams.

Dam Break Flood Hazard
The prerequisites for a dam break hazard are the existence, either permanently or temporarily, of a large body of water or other flowable substances (slimes, tailings etc); and environmental values, including stock, human life or property, that are susceptible to harm should a dam break occur.

A flood generally attenuates over time and ceases to be considered a flood once it is totally contained between the bed and banks of a stream. A high hazard for stock or animals on a flood plain or elsewhere is associated with water depths occurring in excess of 300 millimetres (0.3 metre). The estimated extent of the flood at a particular probability level is called the 'flood footprint'.

If the flood footprint is contaminated by the dam break flood, the environmental harm and potential for consequent harm from contaminants including access by stock or humans to the contaminants, must be fully considered. While environmental values include the ecology, if no significant environmental values exist within the flood footprint, then a conclusion of minimal consequent harm may be justified.

Where tailings or contaminated waters are associated with a dam break flood, environmental harm can also arise from the residual effects of the material deposited. The consequences of a clean up in the general environment can involve substantial costs that would fall within the meaning of 'environmental harm' in the Act.

Basic Hazard Evaluation Data
Applications that involve the construction and operation of any containment structure, must include relevant information on which an initial hazard assessment by the applicant has been undertaken.

Dam owners are likely to have much of the information already available. The minimum information is:

- specification by map/s of the location of the proposed project in relation to surrounding land use and watercourses – including the general topography and contours at a suitable scale,
- details of environmentally sensitive areas, rare and endangered species and human habitation and infrastructure developments in the near vicinity or general area and particularly downstream,
- details of watercourses and groundwater aquifers that are or might be used as water resources,
- engineering sketch drawings, in accordance with good professional practice and sufficient to fully define the layout, structure, volume and proposed means of construction of all aspects of operations associated with the proposal,
- details of quantities and concentrations of all raw materials, products, by-products and waste products produced in operations associated with the proposal, and
- details of all studies conducted to assess requirements for storage and strength of all structures associated with the project – such as hydrological and geotechnical data.

Inspection of Site or Desktop Analysis

Whether or not a site inspection is required for a particular dam as part of a hazard assessment is a matter for consideration by the suitably qualified and experienced person concerned. Relevant factors to consider might be previous assessments, known changes, dams that are located remote from the main project site, and the likely outcomes. However, that person must be satisfied that all relevant aspects have been otherwise researched and documented to enable a reliable hazard assessment in each case.

Any assessment must include areas in the potential failure path or downstream of the dam that could be impacted by collapse or failure of the dam. Relevant matters to be observed include (but are not limited to):

- environmentally significant sites and species located in potential impact areas
- infrastructure including human habitation, worker accommodation and site offices, road crossings
- recreation facilities (bush camping etc.) along watercourses
- raw (fresh water) storages on the same watercourse
- presence of stock, irrigation and domestic water supply pumps, and water holes
- downstream storage containments – such as tailings dams and process water dams
- mine adits (entrances to underground mining) and/or open cuts (voids) – current or proposed
- catchment modification works (diversion drains, bunds etc) – current or proposed

In the case of tailings dams and other waste disposal facilities, a site inspection should also note points of impact above the level of the dam. Typical impacts from such facilities include:

- dusting potential (eg. heavy metals, arsenic)
- gas emissions (eg. cyanide, hydrogen fluoride, hydrogen sulphide, sulphur dioxide)
- spray mist (acid evaporation ponds etc)
- offensive odours
- smoke and heat (including spontaneous combustion of stored material)
- visual amenity

Collation and Assessment of Data

A hazard category based on 'dam break' or 'failure to contain' scenarios, must be determined based on the most adverse environmental harm that can arise from the range of all possible scenarios. The hazard category is based on the consequences of failure, not on the perceived probability of the failure occurring.

The following aspects of possible adverse scenarios should be carefully considered:
Depending on its severity and duration, a rainfall event may give rise to a spill from a dam that does not result in collapse of the dam structure but nevertheless causes some harm.
Rainfall events may be of sufficient intensity and duration to lead to a collapse of the dam structure with consequent increase in harm.
Where potential harm is by release of a contaminant, account should be taken of the potential dilution by clean runoff entering the dam prior to release and potential dilution in receiving waters.

A suitable range of rainfall events will need to be considered in order to cover all potential harm scenarios and the range of performance contained in Tables 4 and 5.
For an earth dam or bund wall, a 'sunny day' failure can also occur due to loss of structural integrity of the wall, such as piping failure or weakness in zones of the wall due to various causes. The probability of such failure mechanisms occurring are reduced by good design and construction practices, and regular inspections by informed operators and qualified professionals.

Hazard Category Assessment Criteria for this Manual

This manual is a regulatory document designed to ensure that appropriate standards are applied to dams. In certain cases, it is reasonable to expect applicable standards to be documented (ie. a 'regulated dam').

All dams as defined must have their hazard category assessed based on the potential harm resulting from failure event scenarios as set out in Tables 1 and 2 as guided by this text. For dams with a volume in excess of 250 megalitres, specific guidance is provided on the following page for assessing the dam break hazard.

However, as set out in the subsequent sections 'Hazard Category based on Height' or 'Hazard Category based on Contaminant Concentration and Minimum Volume', dams that meet the criteria in those sections must be assessed as regulated dams – either in the significant or high hazard category.

Hazard Category - Based on Assessment of Hazard Potential (Failure Event Scenarios)

The two basic possible "failure" sets of scenarios to be applied in any assessment are:

1. **"Failure to contain"** – spills or unplanned releases from the dam due to any cause, and
2. **"Dam break"** - collapses of the dam structure due to any possible cause.

In assessing the hazard category of a dam based on possible failure event scenarios, it is to be assumed that a failure event of each type specified has occurred ie 'failure to contain' and 'dam break', and then the potential environmental harm (ie. the consequences) resulting from each such assumed failure event is to be assessed using Table 1. The hazard category for the dam overall, will be the highest hazard category produced in any category of harm, generated by any failure event scenario.

Failure to contain must consider potential adverse effects due to release to any groundwater systems.

Table 1 Failure to Contain Scenarios

ENVIRONMENTAL HARM	FAILURE TO CONTAIN HAZARD CATEGORY		
	High	Significant	Low
Categories of Harm			
General environmental	Location such that harm to a significant environmental value is likely, or serious environmental harm is possible. Such a value might include the presence of protected or endangered flora or fauna.	The environmental value is of lesser significance and harm is possible but not likely, or material environmental harm is possible.	No environmental values of significance, or only trivial environmental harm is possible.
Loss or harm to humans	Consumption of contaminated waters by humans with consequent loss or harm is likely.	Consumption of contaminated waters by humans with consequent loss or harm is possible.	No contamination of waters used for human consumption expected.
Loss of stock	Consumption of contaminated waters by stock with consequent loss or harm is likely.	Consumption of contaminated waters by stock with consequent loss or harm is possible.	Contaminated water not available to stock or no harm expected from consumption.
General economic loss	Serious harm to communities, industrial, commercial or agricultural facilities, important utilities, the dam itself or other water resources in the failure path.	Material harm to industry, secondary roads, minor railways, public utilities, the dam itself or other water resources in the failure path.	Trivial harm to environmental values such as environmental nuisance arising from minor spills.

The hazard category of a dam can be changed by redesigning the proposal to isolate the dam from the environmental value. However, a hazard category cannot be changed by reliance on another structure, man-made or otherwise (eg. bunds) to control the risk of a failure of the dam, where the bund/s could also be subject to failure under a possible scenario.

In relation to a dam break scenario, consideration must always be given to downstream consequences including failure of other storages that may be affected by the flood wave. The consequences of such sequential failure of other storages must be considered as part of the harm caused.

Where the contained volume of a dam at imminent failure is greater than 250 megalitres, the hazard assessment must fully address the hazard associated with consequent failure of other dams, containments or on-site infrastructure downstream of the dam being considered in the assessment.

Table 2 Dam Break Scenarios

ENVIRONMENTAL HARM	DAM BREAK HAZARD CATEGORY		
	High	Significant	Low
Categories of Harm			
General environmental	Location such that harm to a significant environmental value is likely, or serious environmental harm is possible. Such a value might include the presence of protected or endangered flora or fauna.	The environmental value is of lesser significance and harm is possible but not likely, or material environmental harm is possible.	No environmental values of significance, or only trivial environmental harm is possible.
Loss or harm to humans	Location such that people are routinely present in the failure path and if present loss or harm is likely. Consumption of contaminated waters by humans with consequent loss or harm is likely.	Location such that people are routinely present in the failure path and if present loss or harm is possible. Consumption of contaminated waters by humans with consequent loss or harm is possible.	Location such that people are not routinely present in the failure path. No contamination of waters used for human consumption expected.
Loss of stock	Location of stock such that loss of stock likely. Consumption of contaminated waters by stock with consequent loss or harm is likely.	Location of stock such that loss of stock possible. Consumption of contaminated waters by stock with consequent loss or harm is possible.	Stock not in path of dam break flood. Contaminated water not available to stock or no harm expected from consumption.
General economic loss	Serious harm to communities, industrial, commercial or agricultural facilities, important utilities, the dam itself or other water resources in the failure path.	Material harm to industry, secondary roads, minor railways, public utilities, the dam itself or other water resources in the failure path.	Trivial harm to environmental values such as environmental nuisance arising from minor spills.

For the purposes of assessing the aspect of potential environmental harm in Tables 1 or 2, the cost of potential environmental harm within the meaning of the *Environmental Protection Act 1994* may be taken to be the cost of rehabilitation or restoration of the environmental value harmed.

Hazard Category Based on Height of a Man-made Embankment

While all dams as defined are subject to assessment using Tables 1 and 2 of this document, a dam is a regulated dam if it incorporates a man-made embankment and the height of that embankment is greater than 8 metres as measured between the crest and the lowest point of the toe of that embankment.

That is, such a dam must be assessed as in the significant or high hazard category and not in the low hazard category, even though it could be argued that the dam is low hazard by merely applying Tables 1 and 2.

Hazard Category Based on Contaminant Concentrations and Minimum Volume

While all dams are subject to assessment using Tables 1 and 2 of this document, a dam is a regulated dam if that dam:

a) is likely to contain contaminants at a greater concentration than that indicated in Table 3, or outside the range of pH indicated in Table 3, at any time when the volume contained within the dam is greater than 20% of the contained volume at imminent failure, AND
b) has a contained volume at imminent failure that is greater than that indicated in Table 3.

That is, such a dam must be assessed as in the significant or high hazard category and not in the low hazard category, even though it could be argued that the dam is low hazard by merely applying Tables 1 and 2.

Table 3 - Contaminant Concentrations and Minimum Volumes

Contaminant [1]	Liquor [2]	Total Solids [3]	Dam Volume
Arsenic	1.0 mg/L	500 mg/kg	2.5 ML
Boron	5.0 mg/L	15,000 mg/kg	2.5 ML
Cadmium	10 µg/L	100 mg/kg	2.5 ML
Cobalt	1.0 mg/L	500 mg/kg	2.5 ML
Copper	1.0 mg/L	5,000 mg/kg	2.5 ML
Lead	0.5 mg/L	1,500 mg/kg	2.5 ML
Mercury	2 µg/L	75 mg/kg	2.5 ML
Nickel	1.0 mg/L	3,000 mg/kg	2.5 ML
Selenium	50 µg/L	150 mg/kg	2.5 ML
Zinc	20 mg/L	35,000 mg/kg	2.5 ML
Cyanide	10 mg/L	2,500 mg/kg	2.5 ML
pH	5 to 9 inclusive	Net acid generation pH < 4.5	2.5 ML
Chloride	2,500 mg/L	-	10 ML
Fluoride	2.0 mg/L	-	10 ML
Sulphate	1,000 mg/L	-	10 ML
Salinity (conductivity)	4,000 µs/cm	-	10 ML

1 Metals should be analysed in accordance with recognised test methods by a NATA certified laboratory.
2 These concentrations apply to contaminants in solution, and therefore all samples should be filtered using the techniques described in the Water Quality Sampling Manual (EPA 1994).
3 Applies to the solids in a dam. Total solids include suspended and colloidal solids.

Hydraulic Performance Criteria for Regulated Dams

Hydraulic performance criteria mean the capacity of a regulated dam (as defined) to divert, contain or safely pass flowable substances. The performance criteria addressed below are:

For regulated dams that are NOT 'levees' as defined

- Spillway capacities.
- Design Storage Allowance (DSA).
- Mandatory Reporting Level (MRL).

For regulated dams that are 'levees' as defined

- Design protection (or conveyance) rating.

Application of Performance Criteria

Estimates of quantities based on the performance criteria set out in Tables 4 and 5 of this manual for regulated dams, must be applied as set out below, and documented accordingly.

1. Except as specified below in the section 'Full Hydrologic Analysis for DSA or MRL', a runoff coefficient of 1.0 must be used for all watershed translation of rainfall into runoff and no deductions must be allowed for losses due to evaporation from the ponded area of a dam.

2. For each regulated dam that is not a levee, a spillway must be designed and maintained to pass the peak flow from a design storm of critical duration for the relevant contributing catchment, at the annual exceedance probability (AEP) specified in Table 4. In determining the spillway capacity, the assumption must be made that the dam commences full at the spillway crest level.

3. For each regulated dam that is not a levee, and at any time could contain contaminants whose release would cause material or serious environmental harm, a DSA and MRL must be estimated.

4. The DSA must be provided in the dam or in the flow path below the dam, and must be demonstrated or estimated from either:
   (a) a 'full hydrologic analysis' as specified below and in table 5, OR
   (b) the 'method of monthly deciles' as specified below using the AEP value in Table 5.

If a full hydrologic analysis cannot be conducted, then the 'method of monthly deciles' must be used.

5. For each regulated dam that is not a levee and requires an MRL, an MRL must be estimated as the lowest level (below spillway crest) that will allow either of the following to be retained within the dam:
   (a) the runoff from a 72 hour duration storm at the AEP specified in the Table 5; OR
   (b) a wave allowance at that AEP as estimated using a recognised engineering method.

6. Each levee must be designed and maintained to contain or divert the peak flow from either:
   (a) a design storm of critical duration for the contributing catchment relevant to the zone to be protected by the levee, at an AEP specified in Table 4, OR
   (b) the estimated volume and flow rate of a release of flowable materials resulting from a failure of relevant other works or infrastructure; AND such that
   (c) in at least one place in the levee crest, there is a restricted length of low crest, due to limiting the freeboard at that point or otherwise, such that the flood just exceeding the imminent failure flood of the levee will be directed to a planned area or areas within the zone to be protected.

Important NOTE

Whatever hydrologic techniques are used for estimating required design parameters for a dam, the hazard assessor and dam designer must take into account the effect on hazard category that arises from changes in design of the dam. In particular, the impact on estimated concentrations of contaminants in

releases resulting from unexpected and infrequent rainfall events contributing to dams or systems of dams, must be fully considered by the person assessing or designing the dam.

Full Hydrologic Analysis for DSA, MRL or Levees

A 'full hydrologic analysis' for DSA or MRL must use a model with a maximum daily timestep, and a calibrated watershed component based on soil moisture balance accounting, as set out below. All modelling must be conducted such that it obeys the law of conservation of matter (mass balanced).

The calibration of the watershed component of the model must be conducted using local rainfall data and consequent flows recorded at intervals the same as, or less than, the intervals to be used in analysis. The calibration must be conducted such that all of the following criteria are satisfied:

- at least five events must be used in the calibration, with each event resulting in 100% of the contributing catchment producing runoff at some time during the rainfall event;
- at least one event is estimated to be less frequent than ARI 5 when the real rainfall event is compared against design rainfall events of the same duration from AR&R or CRCFORGE;
- the simulated peak flow must agree with the recorded peak flow to within 30%, and the simulated total volume must agree with the recorded flow volume to within 10%; AND
- calibrations must be reviewed annually based on any additional qualifying events that have been recorded during the interim.

All hydrologic analyses with the calibrated model must use historical rainfall sequences representative of the site and sourced from either the Bureau of Meteorology daily rainfall stations or the Silo Data Drill.

Evaporative losses may be allowed in respect of lake evaporation based on accepted methods - such as Morton's method for shallow lakes. Daily data for Morton's method is available on the Silo Data Drill. No evaporative losses must be allowed for model time steps when rainfall is being applied.

A regulated dam shall be deemed to have sufficient design storage allowance (AEP 0.01) if the system of which it forms a part, does not spill during the continuous water balance simulation. For this condition to be met, a continuous simulation using at least 100 years of data is required (eg. Silo Data Drill). A spill may be acceptable within the simulation only if an outlier event is justified as indicated below.

Where the contributing catchment is less than or equal to 100 square kilometres, the AEP of an event in a 'full hydrologic analysis' and suspected of being an outlier, shall be estimated by matching the total depth of that 'real' rainfall event suspected of being an outlier, with an equivalent total depth for a design rainfall event (of the same duration and catchment area) from AR&R or CRCFORGE.

Where the contributing catchment is greater than 100 square kilometres, the AEP of an event in a 'full hydrologic analysis' and suspected of being an outlier, shall be estimated using frequency analyses of surface water flows from the application of real rainfall to the calibrated model, together with rainfall analyses of contributing catchments (and sub-catchments as relevant) as indicated above.

These methods of AEP estimation for real rainfall events may also be used when estimating volumes for MRL using a full hydrological analysis, as opposed to the default volume estimate method set out below.

Estimating Volume for MRL (Default Method)

The default method for estimating the volume allowance for MRL is to apply a design rainfall event to the contributing catchment of the particular dam or sequence of dams, making conservative operational assumptions: eg. pumps are not operable during the event.

Method of Monthly Deciles for DSA (Default Method)

The 'method of monthly deciles' is the use of a rainfall record of sufficient length, recorded at a location in close proximity to the site physically and in terms of relevant rainfall characteristics, to be acceptable for conservative estimation of rainfall input to a dam.

A critical wet period is determined from Figure 1 based on the physical location of the site relative to catchments in Queensland. The maximum rainfall for the critical wet period each year is then determined and a probability distribution fitted to the data points.

Rainfall depths for relevant AEPs are interpolated or extrapolated as necessary, and 100% runoff is assumed from the relevant contributing catchments to generate run-off volumes for combination with estimated other inputs to the dam over the critical wet period.

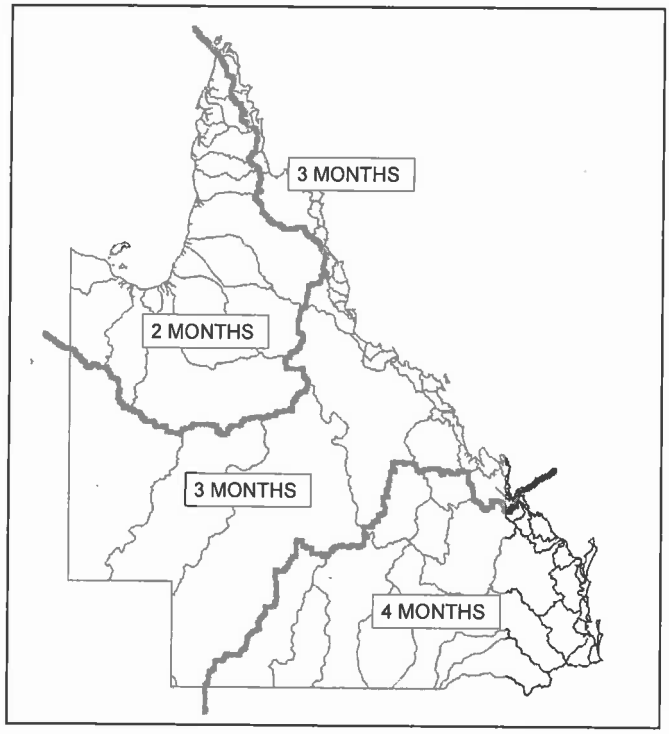
Table 4 Performance Criteria - AEP – Spillway and Levee Design

Operational Life of Dam	Design Event Probability (AEP) by Hazard Category	
	High	Significant
1 year	0.0001	0.001
2 to 5 years	0.00002	0.0002
6 to 10 years	0.00001	0.0001
11 to 30 years	0.000004 (or PMP)	0.00004
More than 30 years	0.000001 (or PMP)	0.00001

Table 5 Performance Criteria - AEP – Design Storage Allowance and Mandatory Reporting Levels

Hazard Category	Design Event Probability AEP		
	DSA Full Hydrologic Analysis	DSA Deciles Analysis	MRL 72 hour event
High	0.01	0.01	0.01
Significant	0.01	0.05	0.01

Figure 1 – Critical Wet Periods for 'Method of Monthly Deciles'



ATTACHMENT 3 - EXISTING ENVIRONMENTAL MANAGEMENT PLAN



QUEENSLAND GAS COMPANY LIMITED

ENVIRONMENTAL MANAGEMENT PLAN FOR ATP 610P, ATP 620P, ATP 621P, ATP 651P, ATP 648P, ATP 632P, PL 179, PL 228, PL 229, PLA 180, PLA 211, PLA 247 AND PLA 257

PREPARED BY

ENVIRONMENTAL & LICENSING PROFESSIONALS PTY LTD ("ELP")

REVISION 03

FEBRUARY 2008

ENVIRONMENTAL MANAGEMENT PLAN FOR ATP 610P, ATP 620P, ATP 621P, ATP 651P, ATP 648P, ATP 632P, PL 179, PL 228, PL 229, PLA 180, PLA 211, PLA 247 AND PLA 257

REVISION 03

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Title	Environmental Management Plan for ATP 610P, ATP 620P, ATP 621P, ATP 651P, ATP 648P, ATP 632P, PL 179, PL 228, PL 229, PLA 180, PLA 211, PLA 247 and PLA 257 O:\ENVIRONMENT\PROJECT EA\FEB AMENDMENT TO INC PLA180\080502 LEVEL 1 EMP REV 03.DOC		
Project Manager	Margaret Harris		
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REVISION/VERIFICATION HISTORY

REVISION NUMBER	DATE	PREPARED BY	APPROVED BY
RevA	26/09/2007	GB	TP
00	28/09/2007	GB	DW
01	2/10/2007	GB	PW
02	8/10/2007	GB	TP
03	02/05/2008	GB	MH

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1.0 INTRODUCTION

1.1 Purpose of Document

Queensland Gas Company Limited (QGC) is the holder, entirely or in part, of a number of petroleum tenements. Currently twelve tenements are subject to environmental authority (EA) number 150161 (the Project EA), which includes Authority to Prospects (ATPs), Petroleum Leases (PLs) and PL Applications (PLAs). These twelve tenements include:

- ATP 610P
- ATP 620P
- ATP 621P
- ATP 651P
- ATP 648P
- ATP 632P
- PL 179
- PL 228
- PL 229
- PLA 211
- PLA 247
- PLA 257

The environmentally relevant activities (ERAs) currently permitted under the Project EA are as follows:

(a) ERA 21D (a petroleum activity otherwise prescribed as a level 1 environmentally relevant activity);

(b) ERA 11(a) (crude oil or petroleum product storing in tanks or containers having a combined total storage capacity of 10,000 L or more but less than 500,000 L);

(c) ERA 17 (fuel burning);

(d) ERA 15(a) (operating a standard sewage treatment works having a peak design capacity to treat sewage of 21 or more equivalent persons but less than 100 equivalent persons);

(e) ERA 24 (boiler making or engineering—commercial boiler making, electrical machine manufacturing or building or assembly of agricultural equipment, motor vehicles, trains, trams or heavy machinery);

(f) ERA 25(a) (Metal surface coating—commercial spray painting (other than spray painting motor vehicles), powder coating, enamelling, electroplating, anodising or galvanising in works having an annual throughput of metal products of less than 2000 t); and

(g) ERA 75(b)(iv) (disposing of regulated waste if the facility is designed to receive waste at the rate of 200,000 t or more a year).

This revised Environmental Management Plan (EMP) forms part of QGC's application to amend the Project EA to incorporate PLA 180, and will take effect following the approval of the amendment application. It details the potential impacts, environmental protection objectives and environmental mitigation measures/controls for petroleum activities to be undertaken on the relevant petroleum tenements. No additional ERAs are proposed to be incorporated into the Project EA.

QGC is the Operator for all of the listed tenements. Table 1 summarises the holder details for tenements subject to this EMP.

Table 1. *Tenements Subject to EMP*

Tenement	Holder(s)
ATP 648P	QGC Origin Energy CSG Limited SGA (Queensland) Pty Ltd
ATP 620P	QGC Origin Energy CSG Limited
ATP 621P	QGC
ATP 632P	QGC SGA (Queensland) Pty Ltd
ATP 610P	QGC Origin Energy CSG Limited SGA (Queensland) Pty Ltd
ATP 651P	QGC
PL 179	QGC Origin Energy CSG Limited
PL 228	QGC Origin Energy CSG Limited
PL 229	QGC Origin Energy CSG Limited
PLA 180	QGC Origin Energy CSG Limited
PLA 211	QGC SGA (Queensland) Pty Ltd
PLA 257	QGC Origin Energy CSG Limited SGA (Queensland) Pty Ltd
PLA 247	QGC Origin Energy CSG Limited SGA (Queensland) Pty Ltd

1.2 Applicant Details

QGC was listed on the Australian Stock Exchange in 2000 with the aim of exploring and developing the coal seam gas (CSG) resources within the Surat Basin in Southern Queensland. Major interests in a number of petroleum tenements are held totalling 7,200 km^2.

QGC's PL 201 was the first granted PL for CSG in the Surat Basin, and Petroleum Pipeline Licence (PPL) 91 also the first of its kind in the area. QGC is currently supplying in full two significant firm gas supply contracts from the Berwyndale South CSG development. Development work to supply further firm contracts are currently underway by the commencement of development of the Argyle, Kenya, Berwyndale and Bellevue Gasfields.

QGC is the Operator in every ATP or PL that it has interests in, and is the Operator of most of the "conventional" prospective acreage that it has interests in. These include:

- Eight CSG prospective Surat Basin ATPs (ATP 574P, 610P, 620P, 621P, 632P, 647P, 648P, 651P) and nine graticular blocks of ATP 676P.
- CSG production tenures PL 180, 201, 228, 229, 179 and associated PPLs in the Surat Basin of Queensland.
- Seven conventional petroleum prospective Surat Basin ATP (ATP 610P, 620P, 621P, 632P, 647P (part), 648P, and 651P), as well as ATP 785P under application.

In addition to the above, QGC is in a joint venture with Origin Energy CSG Limited in the Myall Creek East Block of ATP 647P which is prospective for conventional gas. PLAs also exist for an area over ATP 610 (PLA 247), ATP 648P (PLA 257 and PLA 259) and ATP 621P (PLA 261 and PLA Aberdeen).

SGA (Queensland) Pty Ltd is a wholly owned subsidiary of QGC.

Figure 1a and 1b below illustrates QGC's current petroleum tenures, held either 100% or in joint ventures.

Figure 1a: *QGC Field Operations*

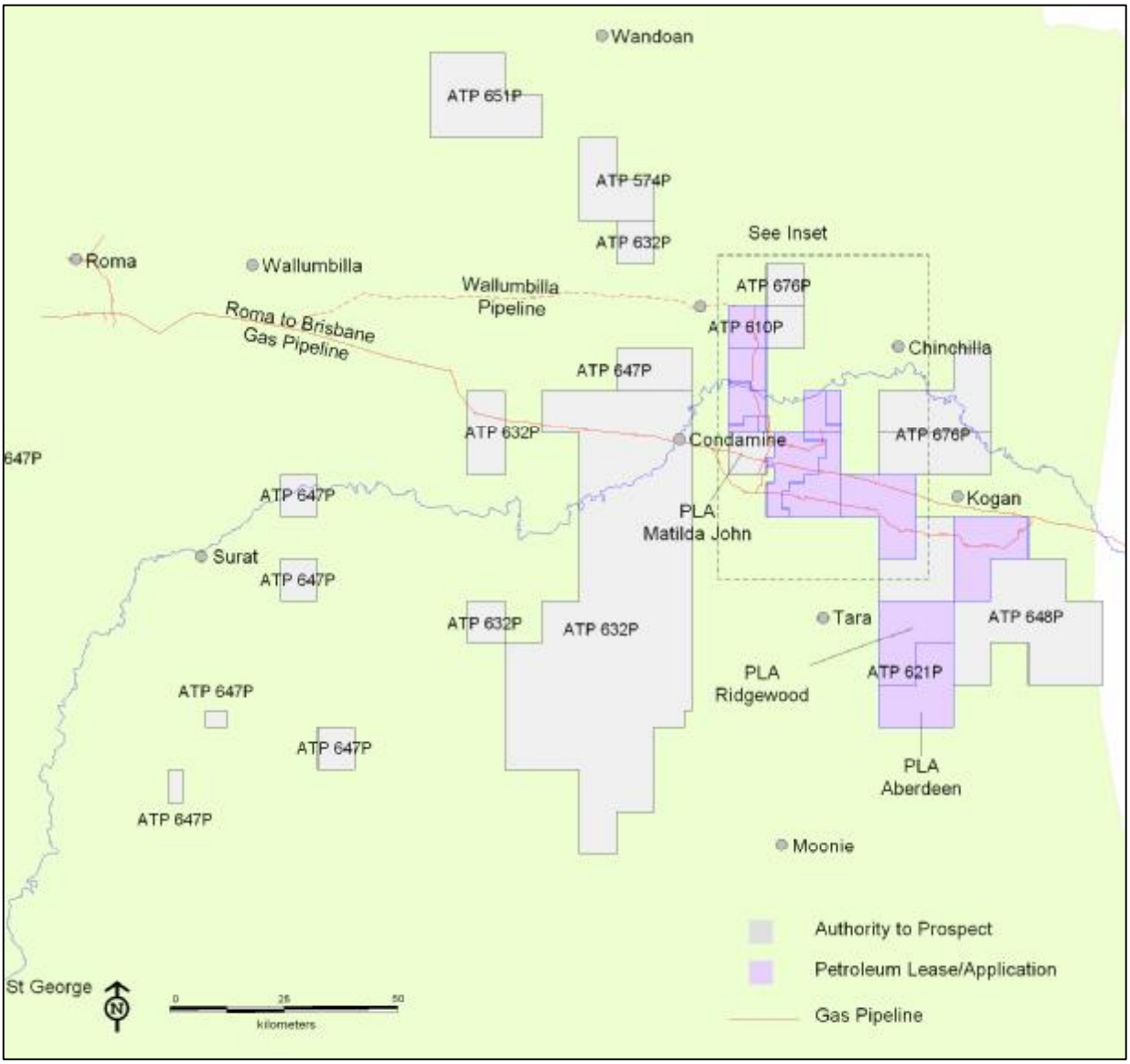
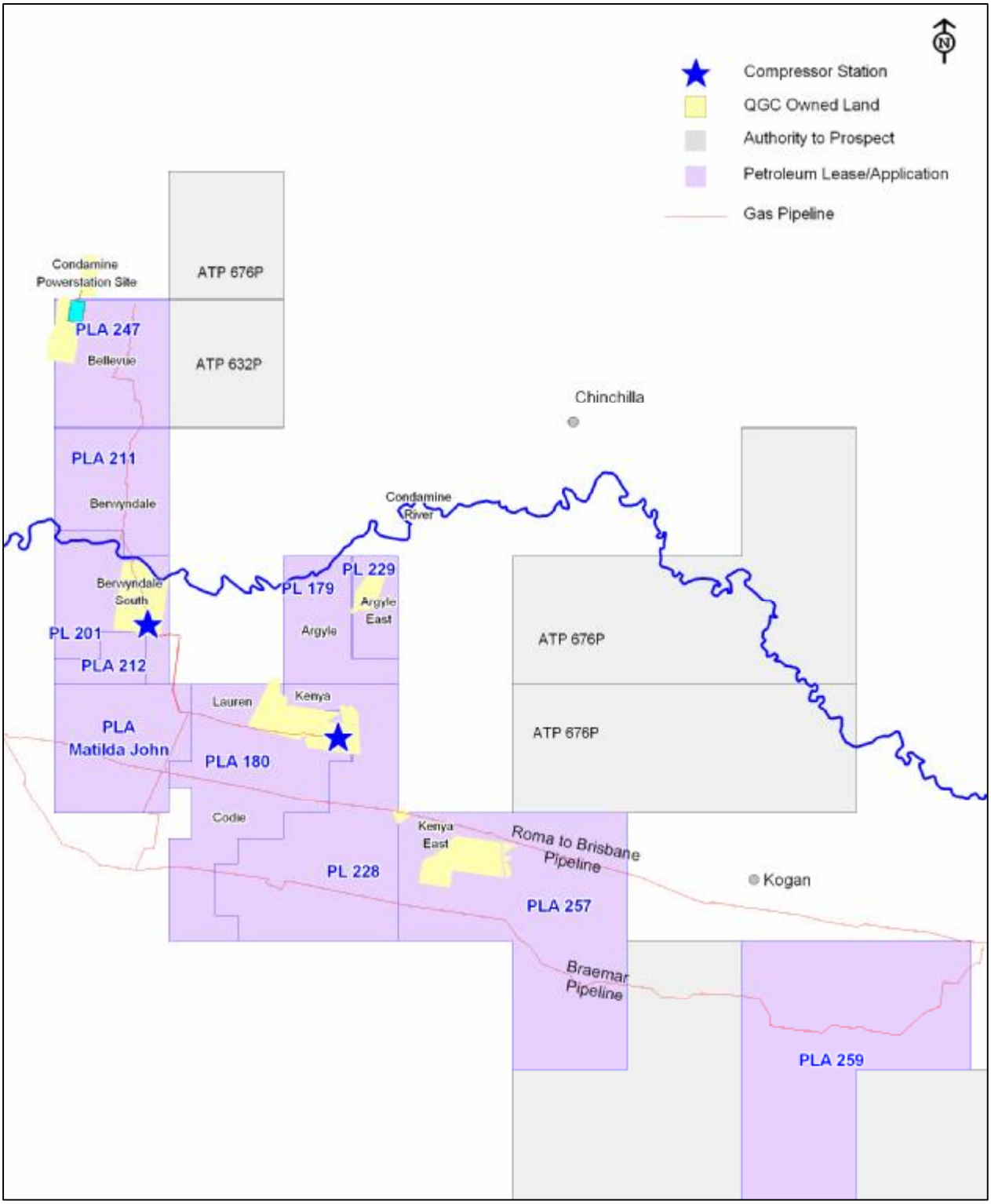


Figure 1b: *QGC Field Operations (inset)*



2.0 DESCRIPTION OF PROJECT

2.1 Location

The thirteen petroleum tenements (including PLA 180) lie within the Dalby Regional council, with a small portion of ATP 651P within the Roma Regional Council, in south-eastern Queensland. A summary of the location of the tenements subject to this EMP are detailed in Table 2 below.

Table 2. *Location of QGC Tenements Subject to EMP*

Tenement	Location
ATP 648P	Approximately 24 km west of Dalby or 30 km south of Chinchilla.
ATP 620P	Approximately 12 km east of the township of Condamine.
ATP 621P	Approximately 12 km east of Tara. The township of Waranga lies within the tenement.
ATP 632P	The tenement is dissected, with the main portion located approximately 20 km southwest of Miles.
ATP 610P	Approximately 6 km east of Miles.
ATP 651P	Roughly 50 km northwest of Miles.
PL 179	Approximately 20 km south west of Chinchilla.
PL 228	PL 228 lies approximately 23 km southwest of Chinchilla.
PL 229	PL 229 lies approximately 16 km southwest of Chinchilla.
PLA 180	Approximately 28 km southwest of Chinchilla.
PLA 211	Approximately 12 km southeast of Miles.
PLA 247	Approximately 6 km east of Miles.
PLA 257	Approximately 30 km south of Chinchilla.

The underlying tenure for PLA 211 is ATP 632P, and the underlying tenure for PLA 247 is ATP 610P. Following PLA approval by the Department of Mines and Energy, the underlying land will cease to be subject to the exploration tenure. PLA 180 lies over a portion of ATP 620P, and PLA 257 overlies ATP 648P.

Appendix 1 details the properties (lot and plan descriptions) underlying each tenement.

2.2 Project Activities

Current petroleum exploration activities include the development of exploration and production well sites, and the construction and maintenance of associated gathering lines, access tracks and evaporation ponds.

A well pad is generally 1 ha (100m x 100m) in size, with a distance of approximately 750 m between each well to optimise production. This pad area allows for the safe placement of site offices, stored pipes and other associated temporary infrastructure a

sufficient distance away from the drill rig. Within this working area is a gas well, a separator, one or two sumps for temporary containment of associated water and a flare pit.

Future activities that have the potential to disturb the physical environment are the establishment and operation of evaporation ponds and compressor units, as well as the further development of well sites and associated gathering lines and access tracks. These activities are listed as below and may include:

- well site selection;
- clearing and establishment of access tracks;
- clearing of a 100 m x 100 m (1 ha) areas for drill set up;
- creation of a 50 m x 50 m (0.25 ha) hard stand areas within the cleared area;
- placement of gravel within cleared area;
- drilling of wells;
- venting/flaring gas;
- sump and flare pit construction;
- construction and operation of gathering lines;
- construction and operation of evaporation ponds for storage of associated water produced during production testing;
- design and construction of reverse osmosis plants (which shall be subject to separate submissions to the EPA);
- construction and operation of compressor units;
- potential seismic surveys;
- operation and construction of sewage treatment works having a peak design capacity of 21 or more equivalent persons but less than 100 equivalent persons (cumulative capacity of sewage treatment works across the project area);
- occasional assembly of equipment involving minor boiler making; and
- spray painting associated with maintenance of infrastructure associated with petroleum activities.

The larger drill rigs that operate within the project area generally are associated with fuel storage of amounts greater than 10,000 L, but less than 500,00 L, hence the requirement of ERA 11(a). Also, temporary fuel storage in the order of 75,000 L is required during the construction of large evaporation ponds.

A number of compressor units are proposed for PL 179, PLA 247, PLA 257 and ATP 648P, necessitating ERA 17 (fuel burning).

A summary of the existing and proposed wells infrastructure is summarised in Table 3 below. Please note that the works described is subject to change in amount or tenement location following well locations, site suitability investigations and exploration outcomes.

Table 3. *Existing and Proposed Infrastructure on Tenements Subject to this EMP*

Tenement Number	Existing Infrastructure	Projected Development
ATP 610P/ PLA 247	17 Bellevue Wells 2 Bellevue Monitoring Wells Bellevue Pond 2	2007-2009 Financial Years 43 production wells Compressor station Evaporation pond
ATP 620	-	2007-2009 Financial Years 1 core well 1 exploration well 3 appraisal wells
ATP 621	8 Aberdeen Wells 6 Ridgewood Wells Ridgewood Pond 1 Aberdeen 2 Pond	2007-2008 2 exploration wells
ATP 632P	-	2007-2010 Financial Years 6 Wells
ATP 648P	1 Broadwater Well 4 Sean Wells 1 Michelle Well 1 Glendower Well 2 Jen Wells 1 Jordan Well 1 Poppy Well	2007-2010 Financial Years Compressor station Evaporation pond > 30 wells
PLA 211	Berwyndale Monitor Well 4 7 Berwyndale Wells	2007-2012 30 production wells
ATP 651	2 Mamdal Wells 1 Ogle Creek Well 7 Woleebee Creek Wells 1 Kathleen Well Ogle Creek 1 Pond Woleebee Creek Pond 1 Woleebee Creek Pond 2	2007-2010 Financial Years Approximately 25 wells Evaporation pond

Tenement Number	Existing Infrastructure	Projected Development
PLA 180	8 Codie Wells 8 Lauren Wells Turner's Pond Robinson's Pond Kenya Pond Lauren Pond 1 compressor station [undertaken under PPL 107]	2007-2009 Financial Years Approximately 60 wells Kenya Processing Plant 2 compressor stations
PL 179	20 Argyle Wells Argyle 1 Pond Argyle 2 Pond Argyle 5 Pond	2007-2009 Financial Years >10 wells 1 compressor station Evaporation Pond
PL 228	22 Kenya Wells Kate Monitoring Well 1	2007-2009 Financial Years >10 wells Evaporation Pond
PL 229	7 Argyle Wells Argyle East Pond 1 Argyle East Pond 2	2007-2009 Financial Years >10 wells
PLA 257	1 Jammat Well 3 Kenya East Wells Kenya East 2 Pond	2007-2010 Financial Years > 10 wells Compressor station Evaporation pond

Table 3 does not include the access tracks and gathering lines that are associated with production well development, which generally need to be constructed connecting to main roads, processing plant, major pipelines and evaporation ponds.

At times a drill rig is accompanied by a temporary camp if the site is in a remote location, relative to the distance to QGC's Windibri or Kenya camp, or a nearby township.

The majority of associated water is currently transferred via the gathering system to existing evaporation ponds, such as Berwyndale South Pond 4 on PL 201 or the Kenya Pond on PLA 180. Berwyndale South Pond 4 on PL 201 and the Kenya Pond are connected via a 315 mm diameter polypipe with connecting pumps that allow transfer. A submission is currently being assessed for an additional large pond (the Rhynie Pond) on the boundary of PLA 180 and PL 228, which includes an environmental risk

assessment operational plan and design specifications (Figure 2). Investigations are currently underway to determine the location of future large evaporation ponds.

The location of future gathering lines, compressor stations and evaporation ponds associated with well development are also yet to be finalised. Gathering line and compressor station placement cannot be optimally placed prior to finalisation of well locations. Evaporation pond placement will also be subject to extensive site investigations to determine site suitability and specific design requirements.

In order to minimise environmental impacts, sections 2.2.1 and 2.2.2 below detail actions and considerations which will be taken prior to and during the establishment of compressor units and evaporation ponds on a tenement, as well as the role of the EPA during the process.

2.2.1 Compressor Units

The development of a production field will require compressors for conveyance of recovered gas to the central processing facility located on Berwyndale South or any future additional processing facilities constructed.

The compression units are driven by low emission variants of natural gas fuelled internal combustion engines. The number of units required or location has not been determined, yet four units consume approximately 550 kg of fuel per hour, in excess of the trigger of 500 kg fuel per hour. This necessitates ERA 17 to be included within the Project EA.

The following is located within a typical compressor station area:

- Compression units;
- Generator;
- Lined evaporation pond for storage of water produced during compression process;
- Lined oil/water interceptor pit;
- Vent stack from which gas will be vented during an emergency shutdown event or if compressors fail;
- Offices and control room;
- Access roads; and
- Car park.

An environmental noise assessment was undertaken in July 2006 for the screw and reciprocating compressors on PL 201 by David Moore and Associates Pty Ltd. Two measurements taken at 100 m from two screw compressors on PL 201 during one evening were 67.5 dB(A) $LA_{10,T}$ and 68.2 dB(A) $LA_{10,T}$.

Noise attenuation measures may be implemented in order to reduce the noise levels from a compression station area to below levels considered to cause environmental nuisance at the nearest sensitive receptors. The attenuation measures may include equipment alignment, modification or construction of a barrier the composition of which will be determined by the degree of attenuation required.

The main waste generated from compressor units will result from general engine and compressor maintenance, where waste oils and parts are produced. Engine and compressor oils are collected in a storage tank which a registered waste oil disposal company removes off-site.

An interceptor pit trap will be required to trap oily water that is a by-product of the compression process. This pit will be lined and inaccessible to fauna. The larger evaporation pond may be lined if underlying material is not suitable. A likely design for the two ponds is summarised in Table 4 below.

Table 4. *Compressor Waste Water System Summary*

Design Details	Interceptor Pit	Evaporation Pond
Volume	216 m^3	21,590 m^3
Width	13 m	114 m
Length	24 m	114 m
Area	310 m^2	13,000 m^2
Bund Height	2 m	2 m
Maximum Water Height	1.7 m	1.8 m
Contents	Oily water	Treated water from interceptor pit

Air emissions of compressor units can be released from the cold vent stack, intermittent start gas and unit blowdown vents and the exhaust. It is difficult to determine characteristics on emissions from the cold vent stack, which generally functions when the field produces too high a quantity of coal seam gas. Frequency of use is extremely low, but volumes can be high when venting.

Tables 5 and 6 below detail likely compressor exhaust and start/blowdown vent emission characteristics based on existing units located on PLA 180.

Table 5. *Compressor Exhaust Characteristics*

Exhaust Characteristic	Details	
Release point description	273 mm in diameter, with a cross-sectional area of 0.051 m^2. At 100% load the exhaust stack temperature is 460 °C, and at 75% load the exhaust stack temperature is 463 °C.	
Minimum release height	7 m	
Minimum velocity	75% load - 35.79 m/sec 100% load - 50.99 m/sec	
Contaminants	NO_x	1.91 kg/hr at 100% load and speed
	CO	1.5 kg/hr at 100% load and speed
	Hydrocarbons	3.3 kg/hr at 100% load and speed

Table 6. *Start and Blowdown Vent Characteristics*

Exhaust Characteristic	**Details**		
Release point description	Approximately 100 mm in width. Utilised only during compressor start up and shutdown, approximately twice a month.		
Minimum release height	3 m		
Minimum velocity	Each start and vent will release approximately $30m^3$ of coal seam methane.		
Contaminants	CH_4	>97%	Approximately 200 kg
	N	2.6%	Approximately 5 kg
	CO_2	0.1%	Approximately 0.2 kg
	Ethane	<0.15%	< 0.3 kg

Table 7 below details the investigations and process involved for the establishment of new compressor units. Environmental management controls in accordance with this process are further detailed in section 6 of this EMP.

Table 7. *Additional Infrastructure Planning Process: Compressor Units*

Stage	**Compressor Units**
1. Planning	A desktop review will be undertaken to ensure appropriate distance from sensitive receptors and environmentally sensitive areas. Planning to minimise the clearing of vegetation and optimal placement in relation to production wells.
2. Site suitability	Investigations at the proposed site will examine site suitability (i.e. slope, susceptibility to flooding).
3. Construction	Appropriate sediment and erosion controls implemented and maintained during construction. Wastes managed appropriately in accordance with this EMP.
4. Operation	Regular inspections and maintenance in accordance with manufacturer specifications on all compressor units. Complaints regarding excess noise or air emissions will be investigated, where monitoring or abatement may be undertaken if deemed necessary.
5. Decommissioning	Upon compressor station decommissioning, all components will be removed off site to an appropriate disposal facility. The compressor station footprint will be rehabilitated to a standard agreed with the affected landholder.
6. Monitoring following decommissioning	If landholder requires establishment of pasture grasses or trees, monitoring will occur to ensure successful revegetation.

2.2.2 Evaporation Ponds

In order to extract CSG, groundwater is produced from the surrounding coal seams at varying rates over the economic life of the wells. The water is transferred from production wells to evaporation ponds via a network of gathering lines. There will be no release from ponds that will result in environmental harm, nor release of associated water for purposes other than authorised under the *Petroleum and Gas (Production and Safety) Act 2004* and the *Water Act 2000*.

Data collated from early wells from QGC's PL 201 indicates an initial average of between 0.56 - 0.64 ML/day of associated water may be produced per well. After extended testing this rate decreases to approximately 0.16 ML/day. The associated water storage requirements of future gas production requires ERA 75(b)(iv).

Evaporation ponds of substantial size (>50 ha) are necessary to ensure QGC has the storage capacity for associated water produced during future commercial operations. It is hoped that beneficial re-use would minimise the water stored in the pond, however, even with re-use large pondage is needed to guarantee water supply to any potential future water customers. Additionally re-use options can be withdrawn at short notice (e.g. a client may close down operations or no longer require QGC water) and QGC needs to have a guaranteed storage capacity available.

A function of this preference is to allow for the pondage of significant volumes of water so that beneficial use options can be realised. The treatment and supply of water to industrial, mining and municipal purposes requires a set capacity to meet contract demands, not merely seasonal deficits. The capital expense of treatment systems also means that significant volumes and duration (e.g. long term) contracts are desirable/necessary. Investigations, including the initiation of approval processes required for treatment facilities and other infrastructure to allow supply of associated water to commercial users, are currently in progress.

A Water Management Strategy has been prepared by QGC which incorporates regular review of evaporation pond capacity and requirements, and options for beneficial use. Current beneficial use options include supply of raw water to a nearby coal washery facility and QGC's Condamine Power Station, as well as potable water to the township of Miles. Beneficial use of a waste and water licence applications will be submitted to the EPA and Department of Natural Resources and Water for each proposed beneficial use.

The design and base material of any future evaporation ponds cannot be determined until water storage requirements are realised and site investigations are undertaken. Where possible, an in situ pond liner will be preferred with considerations made to the rate of unsaturated permeability in the floor of the pond, the physical environment in which it is to be placed, the type of materials to be placed in the pond, the life of the pond, and the overall cost of the exercise.

A risk assessment will be undertaken when investigating the location and design of a new evaporation pond, which will dictate the level of site suitability investigations carried out. Table 8 below briefly details the actions that are undertaken during the planning, construction, operation and decommissioning stages in accordance with the Project EA.

Table 8. *Additional Infrastructure Planning Process: Evaporation Ponds*

Stage	Evaporation Ponds
1. Planning	Soil type should be appropriate and landholder agreement will need to be sought at this stage. A desktop review will be undertaken to ensure appropriate distance from sensitive receptors and environmentally sensitive areas. Location of

Stage	Evaporation Ponds
	ponds within 150 m from a watercourse triggers a review of alternative options and additional management measures.
2. Site suitability and pond design	New ponds may be subject to the following: • soil assessment • electromagnetic surveys • test pitting; • laboratory analysis of soils for engineering classification and dispersion characteristics; • investigations into the hydrogeology and spatial variability of the underlying geology; • characterisation of local (< 5km) groundwater; and • soil-water interaction modelling. If base material does not meet a target permeability rate of 10^{-8} m/s or less, a risk assessment will be conducted and/or alternative such as HDPE liner will be considered. Other design characteristics include: • The spillway is capable of passing a 1 in 100 year storm event. • Spillway located where practicable in the abutment of the evaporation pond or in the minimum height section of the pond. • Spillway discharge contained within a stable defined channel until it enters a natural watercourse. Following site investigations, a detailed pond design and risk assessment by suitably qualified persons can be prepared. If site not deemed to be suitable for a pond, a new site will be sought (Stage 1). The design and results of investigations will be submitted to the EPA for approval.
3. Construction	Prior to construction of a pond, a report detailing the results of site suitability investigations and the proposed pond design will be submitted to the EPA. Appropriate environmental control measures will be carried out during pond construction to minimise erosion, waste generation and impacts to flora and fauna outside of the pond footprint.
4. Operation	Regular monitoring and maintenance of pond structure and groundwater monitoring bores throughout operation. Regular reports on results of monitoring will be submitted to the EPA if any deleterious changes in groundwater quality are detected.
5. Decommissioning	A decommissioning plan will be established for each pond prior to cessation of pond operation in consultation with the EPA and the affected landholder(s).
6. Monitoring following decommissioning	The decommissioning plan will detail the monitoring, maintenance and reporting requirements following EPA and landholder consultation.

Environmental management controls for the design, construction, operation, maintenance and decommissioning of evaporation ponds are further detailed in section 6 of this EMP.

2.3 Rehabilitation

Any rehabilitation of facilities required for petroleum activities will be conducted in accordance with the following processes:

- wells will be decommissioned by plugging, sealing and marking progressively as gas production ceases;
- inactive buried pipelines will be decommissioned in situ consistent with the requirements of Australian Standard 2885;
- aboveground processing facilities will be removed;
- surfaces will be profiled to reduce erosion potential;
- rehabilitation of topsoil to an acceptable level; and
- pasture species appropriate to the land use will be established.

The decommissioning of an evaporation pond will be a function of its operating life and a complete and appropriate design will be made prior to decommissioning. For a high hazard evaporation pond, in situ encapsulation of the saline material by appropriate materials of a low permeability and infiltration reduction of capping and topsoil/rehabilitation media may form the basis of the concept. Surface saline residue and liners (natural base and HDPE) from decommissioned low and medium hazard evaporation ponds are likely to be wholly removed off site to an appropriate disposal facility, such as a high hazard pond area within a QGC tenement.

The compression units will require decommissioning at the end of the project. At this time all components of the compressor units will be dismantled, including concrete footings, and taken to an appropriate disposal facility by QGC or a contractor.

3.0 RECEIVING ENVIRONMENT AND ENVIRONMENTAL VALUES

3.1 Land and Soils

The project area is generally approximately 300 m above sea level, and includes the following land zones (Sattler & Williams, 1999):

- uniform sand plains;
- alluvial plains;
- gently undulating clay;
- duricrusts and footslopes;
- fine-grained sediments; and
- coarse-grained sediments

Maher (1996) has mapped the project area as containing the following land resource areas (Figure 7). ATP 651P was not covered by this particular study. Table 9 below summarises the underlying land resource areas for each tenement.

Table 9. *Underlying Land Resource Areas*

Tenement	Land Resource Area
ATP 610P	2b/7a, 3a, 4a, 4b, 7a, 8a, 9b
ATP 632P	1a, 1b, 2a, 3a, 4a, 4a/4b, 4b, 4c, 5b, 6b, 7c, 8a, 9a
ATP 648P	2a, 2b, 2b/7a, 3a, 4a, 4b, 5a, 7a, 8b, 9b
ATP 620P	1a, 1b, 2b, 3a, 4a, 4b, 7a, 8a, 9a, 9b
ATP 621P	2a, 3a, 5a, 7a, 8b, 9a, 9b
PL 228	2b, 3a, 4a, 4b, 7a, 9b
PLA 247	2b/7a, 3a, 4a, 4b, 7a, 8a, 9b
PL 179	1a, 1b, 2b, 3a, 4a, 7a, 8a, 9b
PLA 211	1b, 4a, 4b, 8a
PL 229	1b, 2b, 3a, 4a, 8a, 9b
PL 180	2b, 3a, 4a, 4b, 7a, 9b

These land resource areas are generally associated with the following soils (as detailed from Maher, 1996):

Table 10. *Common and Associated Soils of Project Area*

Land Resource Area	Soils	
	Common Soils	**Associated Soils**
Clay Alluvial Plains		
1a	Condamine, Cecilvale, Arubial	Combidiban, Davy, Chinchilla
1b	Condamine, Cecilvale, Arubial	Bogandilla, Chinchilla
Poplar Box Flat Plains		
2a	Bogandilla, Arubial	Combidiban, Davy, Chinchilla, Condamine
2b	Braemar, Weranga	Cutthroat, Davy
Cypress Pine Sands		
3a	Chinchilla, Davy, Combidiban, Bogandilla	Nudley, Arubial
Brigalow Plains		
4a	Kupunn	Tara, Arubial, Bogandilla, Rogers, Tandawanna
4b	Tara	Kupunn, Bogandilla, Rogers, Arden, Tandawanna
4c	Tandawanna	Bogandilla, Weengallon, Arden
Brigalow Rises		
5a	Ulimaroa	Bogandilla, Tandawanna
5b	Ulimaroa	Tandawanna, Bogandilla
Rolling Downs		
6b	Inglestone, Inglestone shallow	Weengallon, Tandawanna
Ironbark/Bull Oak Forests		
7a	Braemar, Cutthroat, Channing	Weranga, Highmount, Minnabilla, Davy, Combidiban, Arubial
7c	Braemar, Channing	Coalbah, Cutthroat
Poplar Box Rises		
8a	Coalbah, Bogandilla, Weengallon, Braemar	Cutthroat, Nudley, Kupunn, Arubial
8b	Coalbah, Weranga	Braemar, Cutthroat
Light Forests		
9a	Minnabilla, Braemar, Flinton	Kinkey, Highmount, Channing, Coalbah, Weengallon, Cutthroat, Davy, Bogandilla
9b	Minnabilla, Binkey	Flinton, Channing, Rogers, Cutthroat, Braemar, Coalbah

In addition to petroleum activities, land uses in the area include farming, light grazing, pasteurised land and road reserves (including major sealed roads, to minor unsealed roads).

The *National Action Plan on Salinity and Water Quality* (DNRM, 2002) places the project area within varying hazard areas, from low to high. This indicates that some parts of the project area may be sensitive to land-use changes, with the potential to develop salinity. QGC aim to mitigate the possibility of developing salinity affected areas, in order to minimise environmental harm and effects for landholders, by minimising clearing where practicable.

3.2 Flora

The project area is in the Brigalow Belt Bioregion. Large areas have been modified by clearing, thinning, burning and grazing. Vegetation communities generally fall into one of the following categories:

- Dry sclerophyll forests;
- Brigalow-belah forests; or
- Woodland.

Dominant species generally include ironbarks, poplar boxes, belah, cypress pine, false sandalwood, wilga and *Acacia* species including Brigalow (*Acacia harpophylla*).

Fence lines, road reserves and riparian areas are generally associated with endangered regional ecosystems (EREs). Other small ERE patches are scattered throughout the project area (Figures 3-6).

EREs identified as endangered within the project area include the 11.3.1, 11.4.3, 11.4.7, 11.4.10, 11.4.12, 11.9.4, 11.9.5 and 11.9.6.

EREs will be avoided where possible in accordance with the hierarchy detailed in section 6.3 of this EMP. Desktop studies are undertaken prior to QGC activities and flora and fauna surveys are subsequently undertaken, if deemed necessary.

Potential weeds for the area include *Parthenium spp.*, giant rat's tail grass (*Sporobolus pyramidalis*) mother of millions (*Bryophyllum delagoense*) and Chilean needle grass (*Nassella neesiana*).

Desktop studies involving the use of ESA mapping and recent aerial photography available to QGC are undertaken prior to clearing or site preparation, where flora and fauna investigations are undertaken if deemed necessary. Environmental clearances are carried out by an Environmental Officer prior to site preparation.

3.3 Fauna

An EPA search of protected species identified in the project area was undertaken (Appendix 2). Over 300 results were returned, 38 of which are listed under the Nature Conservation Act 1992 (NC Act) or EPBC Act.

An EPA Wildlife Online search of species within the project area was undertaken (Appendix 2) which returned 24 results, all bird species. One record, *Lophoictinia isura* (square-tailed kite), is listed as "rare" under the *Nature Conservation Act 1992* (NC Act). It is possible the square-tailed kite inhabits the area, as it hunts primarily over open forest, woodlands and mallee communities that are rich in passerines, as well as over adjacent heaths and other low scrubby habitats (Garnett & Crowley, 2000).

A general Birds Australia search was undertaken (Appendix 3) for a square with a north western corner of 149° E/26° S and south eastern corner of 150° N/28° S resulting in 298 species sighted in the area.

3.4 EPBC Act Protected Matters

A desktop search for protected matters under the EPBC Act was undertaken (Appendix 4).

EREs 11.3.1, 11.4.3 and 11.9.5 have been identified as being a threatened community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), due to the dominance of Brigalow. ERE 11.9.4 also has been identified as a threatened

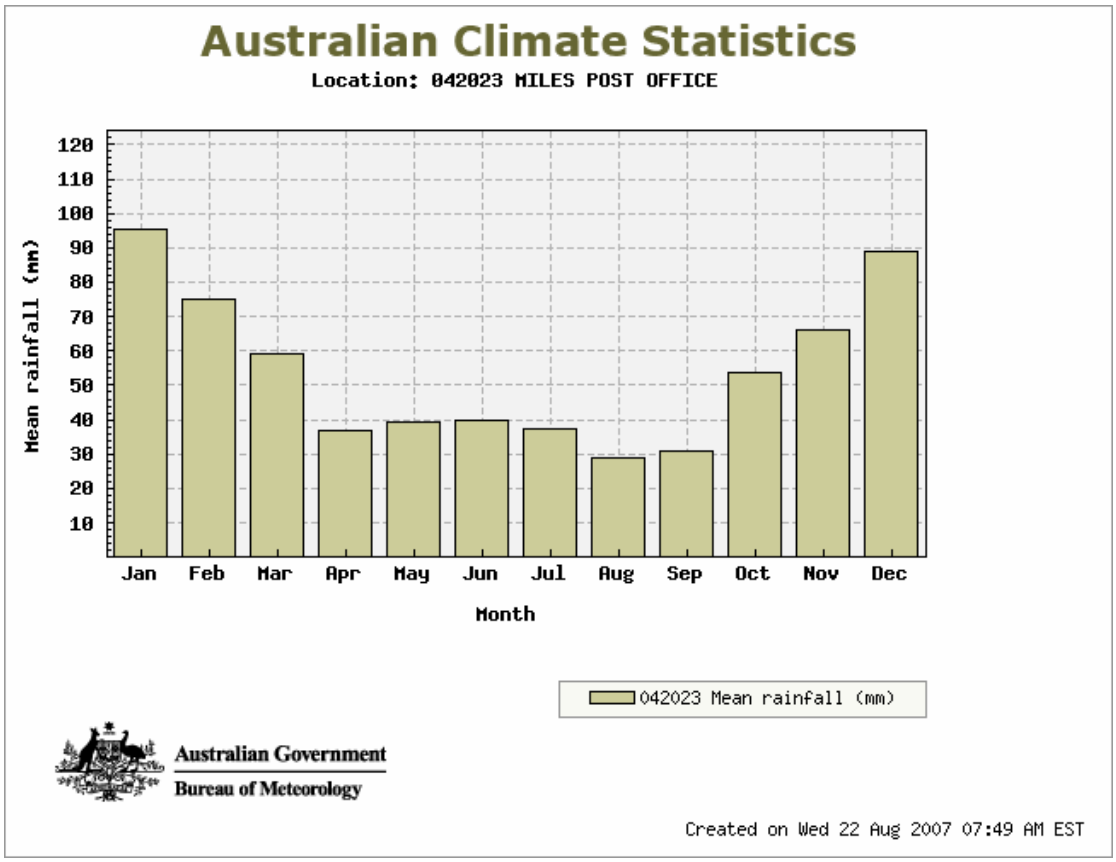
community under the EPBC Act as this ERE is identified as being dominated by semi-evergreen vine thicket.

One Ramsar site was identified as the project area in the same catchment as the Narran Lake Nature Reserve, which is approximately 450 km southwest of the project area. Therefore it is highly unlikely QGC activities will impact the protected area.

3.5 Water

The project area has a mean annual rainfall of approximately 650 mm, with about 55 rainy days (≥ 1 mm) (Bureau of Meteorology, 2007). Figure 8 below details the mean monthly rainfall for the Miles Post Office over a 123 year sampling period.

Figure 8: *Miles Post Office Mean Monthly Rainfall*



A number of watercourses traverse the project area (Figures 3-6). The Condamine River runs through the northern boundary of PL 201 and PL 179. Wambo Creek traverses PL 179 and PL 229, with Nine Mile Creek, Wallumbilla and Cobbareena Creeks crossing ATP 620P and PL 228. Columboola Creek passes through the centre of PLA 247. Wieambilla Creek and Nine Mile Creek are the named creeks running through PLA180. Construction of petroleum infrastructure, such as wells, compressor stations and ponds in the vicinity of defined watercourses will be avoided where practicable.

Associated water quality is generally acceptable for beef stock watering, according to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Total dissolved solids is generally 1500 - 4000 mg/L, with pH typically in the range 8 to 8.5. Fluoride is at times slightly elevated to 4mg/L, but generally acceptable for beef stock watering. Levels of fluoride at times are greater than the recommended value in for livestock drinking water for young animals (2 mg/L).

3.6 Air, Noise and Vibration

The project area is generally rural. Major emissions to the atmosphere from the existing rural undertakings arise due to the burning of grazing land or regrowth clearing activities, bush fires or during high winds when exposed earth on uncultivated fields can increase dust emissions. It is considered likely that background air quality will be close to other similar rural areas in Queensland.

In the rural environment that generally underlies the project area, vehicle movements, farming machinery, QGC compressors and pumps are the main sources of noise above that of the natural background level. Efforts will be made to select appropriate pumps fitted with acceptable noise attenuation devices. Additionally, compressors will be sited with consideration for environmentally sensitive areas and homestead locations. A whole of site noise model is being prepared.

All staff and contractors are made aware of the location of sensitive areas such as homesteads, and take the necessary precautions to minimise impacts to landholders and occupiers as described in section 6.4 and 6.5.

4.0 SUMMARY OF ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

A number of Queensland and federal statutory environmental requirements, policies and guidelines affect QGC's projects and have been taken into consideration during the preparation of this EMP. The statutory requirements are summarised in Table 11 below.

Table 11. *Summary of Legislative Requirements*

Issue	Legislation	Environmental Key Requirements
General	*Environmental Protection Act 1994* *Environmental Protection Regulations 1998*	Requirements for environmental authorities for petroleum authorities General environmental duty, including prevention and reporting of environmental harm. Schedule 1 – Prescribed environmentally relevant activities and amounts for annual fees
General	*Petroleum and Gas (Production and Safety) Act 2004* *Petroleum and Gas (Production and Safety) Regulation 2004*	Requirements for approval and management of petroleum activities, including linkages with environmental authorities.
Noise	*Environmental Protection (Noise) Policy 1997*	Considerations for environmental management decisions by the EPA
Air Quality	*Environmental Protection (Air) Policy 1997*	Considerations for environmental management decisions by the EPA
Water quality	*Environmental Protection (Water) Policy 1997*	Prevention of contamination of water and stormwater runoff.
Contaminated Land	*Environmental Protection Act 1994*	Processes for notification and management of 'notifiable activities' and contaminated land.
Waste Management	*Environmental Protection (Waste Management) Policy 2000* *Environmental Protection (Waste Management) Regulation 2000*	Waste management hierarchy and principles, and environmental management decisions concerning waste Waste tracking requirements.
Flora and Fauna	*Nature Conservation Act 1992* *Environmental Protection and Biodiversity Conservation Act 1999*	Manages wildlife and habitat conservation. Manages wildlife and habitat conservation of national significance.

Issue	Legislation	Environmental Key Requirements
Water Usage	*Water Act 2000*	Requirements or approval of water extraction, usage and associated infrastructure outside that authorised under the *Petroleum and Gas (Production and Safety) Act 2004*.
Weeds	*Land Protection (Pest and Stock Route Management) Act 2002*	Weed management.
Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Queensland Heritage Act 1992*	Requirement for management of Aboriginal heritage. Studies must be copied to the State. Requirement for management of non-indigenous heritage. Studies must be copied to the State.

The environmental protection standards and guidelines that are applicable to QGC operations are summarised in Table 12 below.

Table 12. *Summary of Standards and Guidelines*

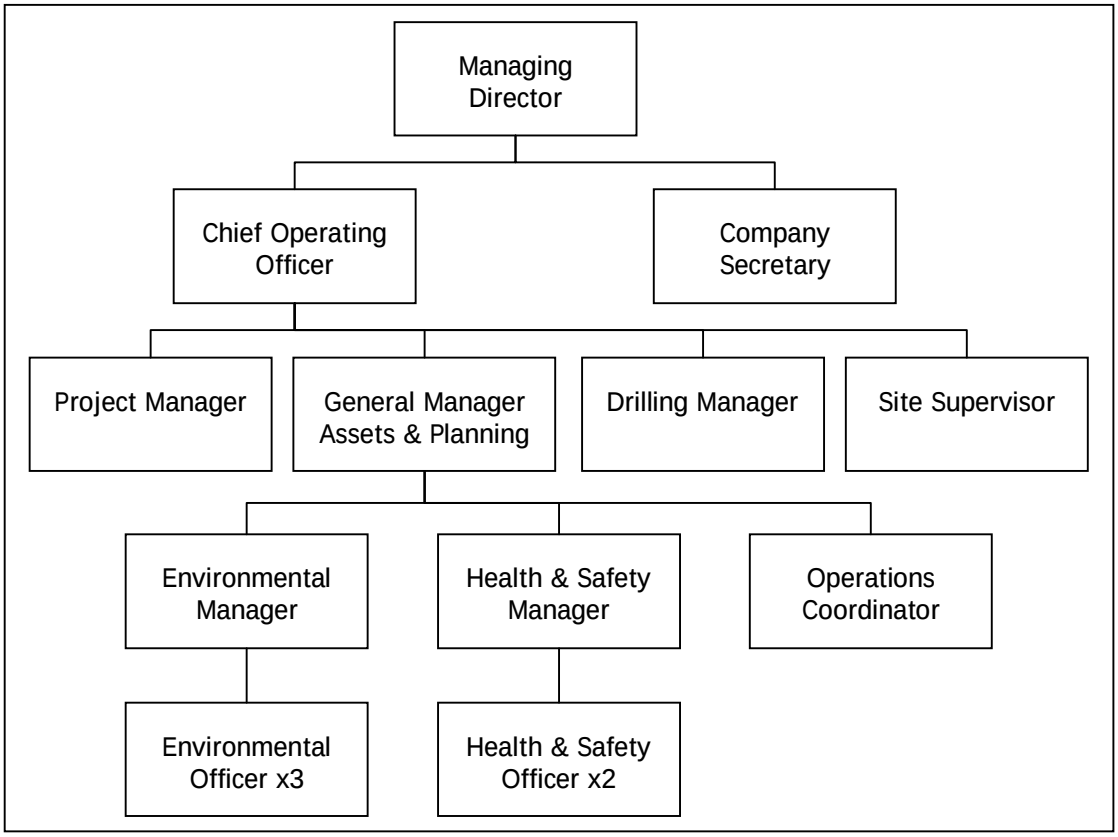
Issue	Standard	Environmental Key Requirements
General	*Australian Petroleum Production and Exploration Association Code of Environmental Practice*	All
Noise	*EPA Noise Measurement Manual*	Details methods for measuring noise.
Air Quality	*National Environmental Protection Council, National Environment Protection Measures for Ambient Air Quality*	Standards and goals for air quality.
Water	*Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC, 2000.* *Operational policy: Management of water produced in association with petroleum activities (associated water)*	Water quality criteria, including that for domestic stock and irrigation use. Describes preferred management of associated water and general approval conditions.
Erosion and Sedimentation Control	*Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites – IE Australia, 1996*	Guidelines for usage of erosion and sediment controls.

Issue	Standard	Environmental Key Requirements
Contaminated Land	*Draft Guidelines for the Assessment and Management of Contaminated Land. 1998*	Guidelines the implications of contaminated land requirements of the *Environmental Protection Act 1994*. Is relevant to any identified areas of contamination at decommissioning.
Storage and handling of dangerous goods	*AS1940 The Storage and Handling of flammable and combustible liquids*	Details precautions for minor storage.
Waste Management	*Waste Management Strategy for Queensland 1996* *DNRMW On-Site Sewerage Code* *DNRMW Guidelines for Vertical and Horizontal Separation Distance* *Standards Australia AS/NZS 1547 On-Site Domestic Wastewater Management*	Waste hierarchy, disposal and storage, approaches. Technical requirements for the management, site and soil evaluation, design, installation and operation of on-site sewerage facilities Details acceptable vertical and horizontal separation distances from buildings, watercourses, bores etc. Australian standard for on-site wastewater management

5.0 ENVIRONMENTAL ROLES AND RESPONSIBILITIES

Sound environmental awareness across all management levels is imperative to successful environmental management. Appointed environmental personnel within QGC have varying roles and responsibilities in regards to environmental management of all or particular tenements.

Figure 9: *QGC Environmental Staff*



5.1 Managing Director

The Managing Director has been nominated by the Board as the executive with the functional responsibility for the environmental performance of the organisation.

5.2 Company Secretary

Reporting to the Managing Director, the Corporate Secretary has been nominated by the Managing Director as the executive with the functional responsibility for implementing and managing systems and procedures for ensuring that QGC operations are compliant with all required State and Federal legislation.

5.3 Chief Operating Officer

The Chief Operating Officer reports directly to the Managing Director and is responsible for corporate compliance.

5.4 General Manager Assets and Planning

The General Manager Assets and Planning coordinates the management of the environment, health and safety, lands and operations, and is responsible for ensuring

petroleum and environmental approvals are in place prior to commencement of activities.

5.5 Operations Coordinator

The role of the Operations Coordinator is to ensure joint venture partner, landholder, cultural heritage and internal environmental approval is undertaken prior to tenement access and commencement of activities. This position is charged with day to day environmental compliance matters.

5.6 Environmental Manager

The Environmental Manager reports to the Manager Facilities and Planning. The key function of this role is to oversee environmental compliance and QGC environmental licensing, and to directly liaise with the EPA.

5.7 Environmental Officer

The Environmental Officer assesses and monitors on site environmental performance during development, project and operations works through to rehabilitation of the Project area.

5.8 Health and Safety Manager

The Health and Safety Manager reports to the General Manager Assets and Planning Manager. The key function of this role is to oversee health and safety compliance.

5.9 Health and Safety Officer

The Health and Safety Officer provides technical support and general oversight in the development and implementation of the company's Safety Management System, programs and procedures.

5.10 Manager - Projects

The role of the Manager - Projects reports to the Chief Operating Officer and manages the implementation of new developments and infrastructure.

5.11 Drilling Manager

The Drilling Manager is responsible for ensuring that all drilling practices (i.e. planning, implementation, demobilisation) are carried out in accordance with the requirements of the EAs. The Drilling Manager will report any non-conformances to the Environmental Advisor and the Project Manager.

5.12 Site Supervisor

The Site Supervisor is responsible for day-to-day operations. Environmental incidents are reported to the Site Supervisor for further action, who discusses environmental issues/incidents at toolbox meetings.

5.13 Staff and Contractors

Staff and contractors are directed to undertake tasks in accordance with this EMP and any other prescribed environmental procedures. They are instructed to immediately report incidents or potential environmental issues to the Site Supervisor.

6.0 ENVIRONMENTAL IMPACTS AND CONTROLS

QGC's objective is to assess and access petroleum resources in an environmentally responsible manner, minimising impacts on the environment and surrounding land uses. Siting of wells is constrained by geological and technical factors, and often also by the relevant landholder's operational and development plans. Environmental issues are considered in planning and placement of well sites, access roads, gathering lines and other infrastructure.

The following environmental aspects are considered in planning activities:

Table 13. *Environmental Aspects Impacted by QGC Activities*

Activity	Potential Environmental Aspect
Well and associated infrastructure site preparation (includes clearing, grubbing, compaction and laying of gravel)	Land Water Flora and fauna Air Noise and vibration Waste Cultural Heritage
Movement and maintenance of vehicles, equipment and machinery	Land Flora and fauna Air Noise and vibration Waste
Drilling	Air Noise and vibration Waste
Gas flaring	Air
Construction and operation of associated water storage facilities	Land Water Flora and fauna Waste
Compressor station construction and operation	Land Flora and fauna Air Noise and vibration Cultural Heritage
Seismic surveys	Land Flora and fauna

Efforts to prevent and mitigate impacts on these environmental aspects include establishing an environmental protection objective, setting specific performance targets, formulating mitigation strategies, and defining monitoring, reporting and corrective actions.

6.1 Land Management

Well preparation activities incorporating clearing, grubbing and other earthmoving operations have the potential to increase erosion rates or, in the event of a significant rainfall event, create sediment-laden runoff. Gathering line installation involves the temporary storage of topsoils and subsoils, which can result in increased erosion and sedimentation, and potentially subsoil/topsoil inversion.

Some areas within the project area are likely to have dispersive soils, therefore precautions must be made in these areas if major development (such as construction of facilities) to ensure minimal adverse impacts to the land.

Large quantities of fuel are required in areas where drill rigs are operating, so the storage container is mobile. Fuel is also required to be located in large quantities in areas undergoing major works (i.e. construction of large evaporation ponds). Permanent chemical storage for large quantities is not required.

In response to the identified impact sources, QGC has developed strategies and procedures to mitigate the impacts on the receiving land, detailed in section 6.1.1 below.

6.1.1 Land Management Plan

Element	Management Plan
Environmental Protection Objective	*To retain a stable landform and minimise disturbance and contamination to the existing environment.*
Performance Targets	• Minimal erosion rates. • No change in drainage pattern, leading to soil erosion. • Minimal topsoil degradation. • No contamination to land. • Stormwater runoff from disturbed areas managed with appropriate sediment control devices. • No inversion of topsoil and subsoil. • Well compacted trench line with appropriately installed trench breakers and contour banks if required. • No exposure of flowlines. • No complaints from landholders or occupiers.
Potential Impact Sources	• Clearing vegetation and grubbing exposing susceptible soils to erosion. • Oversized work areas. • Uncontrolled/unnecessary disturbance of land. • Installation of gathering lines and access tracks. • Movement and maintenance of vehicles and equipment. • Contamination following hazardous substance spills or leaks. • Leakage from associated water storage facilities (control

Element	Management Plan
	strategies detailed in section 6.2). • Leakage from gas or water lines. • Seismic surveys.
Mitigation Measures	• Sediment and erosion control measures established appropriate to each site. • Undertake preliminary soil investigations to determine soil suitability of proposed sites of large infrastructure and if further investigation or mitigation measures is required. • Avoidance of working and creating access in sensitive areas (including areas prone to erosion, drainage lines and heavily vegetated areas) where reasonably practicable. • Clearing of mature trees avoided where reasonably practicable. • Rootstock maintained where possible. • Topsoil graded from the site will be stockpiled where it can be readily recovered for respreading and where loss through wind, or water erosion or other means will be minimised (if planned to be reinstated within 6-12 months). • Topsoil stockpiles will be maintained at a height less than 2 metres. • All stockpiles will be situated away from drainage lines and bunded or protected by silt fences. • Subsoils will be stored separately to topsoils. • Working and sump areas will be minimised. • Limit drill sites to 100 m x 100 m areas. • Utilise existing access tracks where practicable. • Avoidance of unnecessary clearing of vegetation. • Any trench will be kept open for the least amount of time practicable (particularly on slopes leading to drainage lines). • Erosion berms will be established on slopes to divert rainfall runoff away from gathering line easements. • Repair of active erosion and piping processes. • Waste oil to be removed offsite. • Used oil filters to be drained and dispatched to a licensed facility for disposal. All other oil contaminated items including rags and oily hoses to also be disposed of at a licensed facility. • Soil which becomes contaminated with any fuel, oil or waste to be remediated as soon as possible. Any contaminated soil removed to be taken to an appropriate facility. • Use of low toxicity, water-based drilling fluids where

Element	Management Plan
	possible to avoid land contamination. • Regular maintenance of vehicles and equipment offsite to minimise the potential for site contamination through oil or fuel leakage. • Hazardous substances will be stored in bunded areas and in accordance with AS 1940. • Regular inspections of any hazardous, flammable and combustible liquid storage areas. • Spills of dangerous goods to be rendered harmless and collected for treatment/disposal. • Spill equipment will be available where dangerous goods are in use. • Suspension of activities during adverse weather conditions (such as heavy rainfall or high winds). • Material for hardstand areas will be sourced by local suppliers with the ability to provide uncontaminated material. • Topsoil will be reinstated following excavated subsoil that has been reinstated and compacted. • Regrade working areas to original contours of land during rehabilitation. • All designated minor maintenance areas to be remediated and rehabilitated following the completion of construction activities. • Seismic lines aligned to avoid sensitive areas.
Monitoring and Reporting	• Inspection and maintenance of erosion and sediment controls following significant rainfall events. • Regular inspections and maintenance of vehicles and equipment. • Regular inspections and maintenance of gas and water gathering lines. • Reporting in accordance with section 7 of this EMP. • Visual inspections of soil management practices.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue. • Make necessary remediation to affected landscape to return to pre-disturbed state. • Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action.

6.2 Water Management

A number of major rivers and ephemeral creeks traverse the project area, whereby the installation of gathering lines and access tracks has the potential to impact on local watercourses. Gas wells, compressor stations, site offices and other facilities are generally placed away from creeks and gullies to avoid impacting watercourses and potentially damaging infrastructure.

A new well will produce approximately 600 kL of water a day, with a decline over extended testing such that roughly 160 kL a day is produced on average at the conclusion of testing. QGC develops its CSG fields so that production water is managed to mitigate adverse impacts on the receiving environment and beneficial use options are considered and encouraged where reasonably practicable.

There is the potential for drawdown of groundwater levels to occur within the coal seam aquifer. Indirect impacts to shallow groundwater resources are considered less vulnerable from coal seam gas development due to the low vertical hydraulic conductivity (Department of Natural Resources, Mines and Energy, 2004).

Associated water quality will be monitored regularly in accordance with a water quality monitoring plan across gas wells and evaporation ponds. In early phases of well testing, water samples are drawn and analysed monthly to establish a baseline, with sampling frequency reduced to quarterly after 3 months of production. Samples are drawn monthly at commingled streams from flow lines servicing multiple wells and from ponds.

Section 2.3 of this EMP details investigations and actions that will be undertaken prior to the construction of new evaporation ponds.

Section 6.2.1 below details the water management for the tenements subject to this EMP.

6.2.1 Water Management Plan

Element	Management Plan
Environmental Protection Objective	*To minimise the impact of site activities and prevent contamination on receiving waters.*
Performance Targets	• No contamination of surface waters. • Acceptable levels of groundwater contamination. • No complaints from neighbouring landholders.
Potential Impact Sources	• Hazardous and waste substance spills/leaks. • Leakages from associated water containment facilities. • Access tracks and gathering lines crossing creek lines. • Sedimentation of watercourses due to soil erosion. • Leakage from water lines. • Decommissioning of wells and facilities.
Mitigation Measures	• Finalisation and regular review of water quality monitoring plan. • Storage of hazardous substances in bunded areas and in accordance with AS 1940. • Regular inspections of hazardous substance areas. • Spills of hazardous substance will be rendered harmless

Element	Management Plan
	and collected for treatment/ disposal. • Risk assessment of new evaporation pond location and design prior to installation. • New evaporation ponds designed by suitably qualified engineers and undergo an 'as-built' survey to confirm design following construction. • Ponds designed to withstand a 1 in 100 year storm event. • Ponds will have a minimum freeboard of 0.5 m. • Embankment walls will be kept free of trees and shrubs capable of threatening wall integrity. • Evaporation ponds will be regularly inspected for integrity and appropriate freeboard levels. • High hazard evaporation ponds will undergo structural and hydraulic integrity inspections annually by a suitably qualified engineer. • Ponds location within 150 m from a watercourse triggers a review of alternative options and additional management measures. • Sumps will have a capacity less than 3 ML where practicable. • Associated waters disposed of in an appropriate manner (i.e. pumped to a holding pond or used for construction, on-site, domestic or stock watering purposes). • Appropriate procedure to place associated water in storage facility followed, with relevant staff trained in the procedure. • Evaporation ponds designed in consideration of site soils applied to embankment and floors. • Cleared vegetation or stockpiles will be stored away from drainage lines. • Sediment and erosion control measures established appropriate to each site. • Runoff along flow line routes will be distributed to the greatest extent possible, particularly in critical areas (e.g. adjacent to watercourses, highly erosive soils) by the use of turn-off drains, contour banks etc. • Clearing will be avoided in riverine areas where practicable. • Clearing will be avoided within 50 m of a high bank of a watercourse where practicable. • Working and creating access in sensitive areas (including areas prone to erosion, drainage lines and heavily vegetated areas) will be avoided where practicable. • Any water released to land will be determined to be suitable in accordance with latest water quality guidelines prior to release.

Element	Management Plan
	• Appropriate decommissioning plan closed out by senior environmental management prior to undertaking of decommissioning. • Fertilisers and soil supplements during rehabilitation will be used only as necessary, and shall be minimised to reduce the risk of increasing nutrient levels in watercourses. • When decommissioning, all liquids will be removed from ponds either by evaporation or active removal. • Residue within ponds will be encapsulated in situ, or removed off site to a licensed waste storage facility. • Ponds will be decommissioned so as they no longer contain flowable substances and are stable landforms.
Monitoring and Reporting	• Inspection and maintenance of erosion and sediment controls following significant rainfall events. • Regular inspections and maintenance of vehicles and equipment. • Regular inspections and maintenance of gas and water gathering lines. • Monitoring and reporting will be undertaken in accordance with section 7 of this EMP. • Water quality of pondage, bores and production wells routinely monitored. • Regular monitoring of associated water storage facility integrity by suitably qualified person.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue. • Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action.

6.3 Flora and Fauna

QGC is committed to causing minimal impact to vegetation communities and inhabiting fauna, including domestic stock, by incorporating the avoidance of vegetation clearing and weed propagation into exploration and production planning.

A wash down facility will be installed in PL 201 which vehicles without valid weed hygiene certificates or logs can utilise.

Associated water storage areas, wells, access tracks, gathering lines and other infrastructure are placed in previously disturbed areas where reasonably practicable. EREs will be avoided where possible and any necessary minor clearing will occur in accordance with the limitations outlined below.

6.3.1 Flora and Fauna Management Plan

Element	Management Plan
Environmental Protection Objective	*To minimise impact of site activities on flora, fauna and Environmentally Sensitive Areas (ESAs).*
Performance Targets	• Minimal adverse impacts on native and domestic fauna. • Minimal impact on ESAs. • No impact on communities threatened under the EPBC Act. • No unplanned or unapproved disturbance to flora. • No declared weeds introduced to any new areas. • Revegetation to a stable condition following rehabilitation. • Restoration of wildlife habitat following rehabilitation.
Potential Impact Sources	• Clearing of vegetation. • Vehicle movement impacting fauna. • Spread of pest species through equipment movements. • Inhibition of fauna movement due to dissection of habitat corridors. • Stockpiling of topsoils (loss of biological quality).
Mitigation Measures	• Land access undertaken in accordance with section 7.2 of this EMP. • Unnecessary clearing of vegetation to be avoided where practicable. • Site access via designated and/or existing tracks. • Clearing of mature trees avoided where practicable, with trees to be retained marked clearly prior to clearing. • Desktop studies of areas prior to planning or establishment of infrastructure to avoid impacting potentially significant vegetation communities/habitats. A field flora and fauna survey may be required prior to the commencement of works in certain areas. • Supply of accurate maps and geographical position system (GPS) points to on-site staff illustrating environmentally sensitive areas (including ephemeral creeks and remnant vegetation) that must be avoided. • Fencing erected to limit access to ESAs if required. • Where no reasonable alternative exists, activities undertaken near a Category B ESA (which includes EREs) will be undertaken in the following order of preference: – pre-existing areas of significant disturbance; – undisturbed areas more than 100 m from the ESA; – undisturbed areas less than 100 m from the ESA; – pre-existing areas of significant disturbance within the ESA; – areas within the ESA of lower environmental value; – and areas where clearing of an ESA is unavoidable

Element	Management Plan
	provided the clearing does not exceed 10% or 3,600 m^2 of a polygon mapped as an ESA and all reasonable effort is made to minimise the area cleared and to avoid clearing mature trees. • Where practicable, clearing will be avoided: – within 50 m of a high bank of a watercourse; – that isolates clumps or dissects corridors of vegetation; – on slopes greater than 5%; and – in riverine areas. • Speed limits will be imposed on-site to avoid fauna impacts. • Annual weed surveys will be undertaken. • Staff and contractors will be made aware of potential weed species. • Vehicles, equipment, plant machinery and organic materials must have a valid weed hygiene declaration or wash down certificate prior to entering on site. • If water is used to clean vehicles on-site, any weeds which germinate in the settlement area will be destroyed. • Following identification of weeds, the area will be mapped and if necessary quarantined and removed. • Where requested by the landholder, fencing will be installed and maintained around petroleum infrastructure. • Slopes of sumps or trenches suitable for fauna exit. • Petroleum activities planned so as to avoid movement of stock not envisaged by the landholder. • Stockpiled topsoil and seed stock will be respread on graded surfaces in an even layer to assist natural regeneration. • Minor surface roughness will be encouraged when spreading topsoil to trap water and seed. • Seed mixtures will be formulated specific to the area and in consultation with landholders, with preference given to native species. • Rehabilitate sites where activities have ceased as soon as practicable. • Rehabilitation activities will be approved internally by QGC's Environmental Manager prior to commencement.
Monitoring and Reporting	• Monitoring and reporting will be undertaken in accordance with section 7 of this EMP. • Monitoring of reinstated vegetation to ensure successful establishment and site rehabilitation. • Regular weed inspections.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue.

Element	Management Plan
	• Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action. • Re-application of seed if required following rehabilitation.

6.4 Air Quality

It is not anticipated that QGC activities within the project area will result in significant adverse impacts on the surrounding local air shed. The major sources of air emissions are from dust generated from well site preparation, gathering line installation and vehicle or equipment movement. Gas flaring or venting occurs occasionally when testing pilot wells.

Compressor units may impact on local air quality. Site selection, operation and decommissioning of compressor units will occur in accordance with section 2.2.1 of this EMP.

QGC's air quality management plan is detailed in section 6.4.1 below.

6.4.1 Air Quality Management Plan

Element	Management Plan
Environmental Protection Objective	*To minimise adverse impacts on the local air sheds of QGC tenements.*
Performance Targets	• No environmental nuisance caused to sensitive receptors. • No complaints.
Potential Impact Sources	• Clearing and grubbing. • Vehicle and equipment movements. • Flaring or venting of gas.
Mitigation Measures	• Activities within cleared areas with exposed soils kept to a minimum. • Dust suppression techniques employed if dust becomes inhibitive to site amenity. • Plan activities to prevent or minimise dust generation from impacting sensitive receptors. • Maintenance of vehicles and equipment to ensure excess air emissions do not occur. • Regular maintenance of compressor units as per manufacturer specifications. • Cessation of activities during occasions of extreme winds to minimise dust creation. • Consult landholders regarding activities potentially having an affect on the local air shed prior to commencement of activity. • Respond to complaints accordingly.
Monitoring and Reporting	• Monitoring and reporting will be undertaken in accordance with section 7 of this EMP.

Element	Management Plan
	• Use of complaints register. • Regular visual monitoring to ensure excess dust is not generated. • Regular vehicle maintenance.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue. • Use of complaints register and incident reporting process to monitor and remediate complaints. • Examine cause of complaint as they occur and implement remedial action. • Temporary suspension of activities if dust is not controllable. • Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action.

6.5 Noise and Vibration Management

Noisy activities which will be undertaken on a tenement include drill site preparation and drilling operations, as well as gathering line installation and general vehicle movement. Excess vibration may be generated due to drilling activities or movement of heavy vehicles or machinery, but activities are generally conducted with sufficient separation from land occupiers to avoid nuisance.

Compressor unit operation will generate noise above that of background, potentially adversely affecting nearby sensitive receptors. Unit positioning will minimise impacts to sensitive receptors, and noise attenuation measures may be implemented if required.

QGC is committed to maintaining a positive relationship with landholders affected or likely to be affected by petroleum activities. Those landholders are consulted in planning and undertaking the processes of drill, gathering line installation and access track construction. Section 6.5.1 below details QGC's noise and vibration management plan.

6.5.1 Noise and Vibration Management Plan

Element	Management Plan
Environmental Protection Objective	*To not cause environmental nuisance with excess noise and/or vibration to sensitive receptors.*
Performance Targets	• No complaints. • Noise generated is kept to a minimum. • Minimal vibrational impact to landholders and occupiers.
Potential Impact Sources	• Drill site preparation. • Drilling operations. • Vehicle and equipment movement.
Mitigation Measures	• Provide notice to sensitive areas of upcoming activities

Element	Management Plan
	which may result in excess noise and vibration. • Where practicable, position working areas away from sensitive receptors. • Keep working hours to between 7am and 6pm when working near sensitive areas. • Where necessary, equip machinery with noise control devices. • Maintenance of equipment to maintain manufacturer's specifications. • Regular maintenance of compressor units as per manufacturer specifications.
Monitoring and Reporting	• Regular maintenance of equipment. • Use of complaints register and incident reporting process to monitor and remediate complaints. • Noise monitoring may need to be undertaken to address any relevant noise complaints received. • Monitoring and reporting will be undertaken in accordance with section 7 of this EMP.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue. • Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action.

6.6 Waste Management

Other than associated water (please refer to Section 6.2.1 for more detail regarding the management of associated water), the majority of wastes generated on QGC sites are general or domestic wastes and waste oils.

Waste oils and water are generated from compressor units, detailed in section 2.2.1 above. A compressor station will have an oily-water separator, from which oil will be removed off site to a licensed waste disposal facility and water will be disposed of on site in an evaporation pond (generally 100 m x 100 m).

6.6.1 Waste Management Plan

Element	Management Plan
Environmental Protection Objective	*Not to create unnecessary wastes, recycle where practicable and to dispose of general and regulated wastes in accordance with State legislation and policies.*
Performance Targets	• No spills or leaks to the receiving environment. • Sewerage disposed of accordingly. • All hazardous substances stored securely. • No wastes remaining on sites following completion decommissioning.

Element	Management Plan
	• No complaints received. • Wastes generated from compressor units disposed of in an appropriate manner.
Potential Impact Sources	• Waste generated from work areas and machinery. • Clearing of vegetation.
Mitigation Measures	• Provision of refuse containers at all sites including drill rigs. • Small sewerage treatment systems (less than 21 persons) constructed and maintained in accordance with AS 1547, the *DNRMW On-Site Sewerage Code* and *DNRMW Guidelines for Vertical and Horizontal Separation Distance*. • Where practical segregating, stockpiling and salvaging reusable and recyclable wastes. • Regular removal of all waste material off site for recycling, reuse or disposal in a licensed landfill/treatment plant. • Areas designated for maintenance and refuelling. • Storage of fuels and oils in accordance with AS 1940. • Waste oil to be collected for recycling. • Used oil filters to be drained and dispatched to a licensed facility for disposal. All other oil contaminated items including rags, oily hoses etc to also be disposed of at a licensing facility. • Cleared vegetation left in cleared areas to minimise erosion with any excess burnt (in accordance with fire permits) or fragmented. • Oil from compressor station wastes contained in oil-water interceptor pit and removed off site to licensed waste disposal facility.
Monitoring and Reporting	• Monitoring and reporting will be undertaken in accordance with section 7 of this EMP. • Regulated wastes to be tracked. • Visual inspections of waste management strategies.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue. • Non-compliance and incident reporting will be closed out by senior management to ensure prompt corrective action.

6.7 Cultural Heritage

QGC has developed an extensive project specific cultural heritage management regime that incorporates a process of survey, development of management plans and mitigating and monitoring as required.

The traditional owner groups have welcomed the process and QGC has developed a voluntary long-term agreement with the traditional owner groups to provide employment opportunities, education and training and a process of ongoing communication and consultation. QGC has applied this process successfully in undertaking its extensive gas field developments to date.

6.8 Social

QGC have an internal system of landholder consultation, whereby landholder issues and concerns are taken into consideration during the well placement, access track and gathering line planning process.

6.8.1 Social Management Plan

Element	Management Plan
Environmental Protection Objective	*To establish and maintain a positive relationship with landholders and other affected persons.*
Performance Targets	• Site access and drilling locations are in accordance with landholder approval. • Minimal impacts to landholder farming practices. • Rehabilitation of sites returns land to agreed final land use.
Potential Impact Sources	• Site access. • Gathering line installation. • Preparation of well sites. • Drilling.
Mitigation Measures	• Agreement to development plans obtained from relevant landholder prior to commencement of activities. • Land access undertaken in accordance with section 7.2 of this EMP. • Exchange information and consult with landholders and other affected persons. • Promptly identify and address potential concerns and conflicts of interest. • Close gates (if left closed) upon property entry and exit. • Where requested by the landholder, fencing will be installed and maintained around petroleum infrastructure. • Facilitate arrangements for the use and maintenance of infrastructure and construction of new roads if necessary. • Where practicable, drilling will be avoided during agricultural/pastoral seasons if requested by landholder. • Rehabilitation of areas following completion of activities to that of the previous state.
Monitoring and Reporting	• Monitoring and reporting in accordance with section 7 of this EMP. • Monitoring and reporting of complaint levels.
Corrective Actions	• Assess current management strategies and implement control strategies appropriate for the specified issue.

Element	Management Plan
	• Examine cause of complaint and implement remedial action.

7.0 SUPPORTING DOCUMENTATION

7.1 Staff Training

All personnel on site will be trained to the appropriate level of environmental awareness and competence to ensure continued environmental due diligence, implementation of appropriate mitigation measures and ongoing minimisation of environmental harm.

Site supervisors will undergo environmental awareness training which will cover;

- The importance of conformance with the environmental authority and components of the EMP and the relevant EA;
- Significant aspects and impacts and the benefit of improving environmental performance;
- Roles and responsibilities for achieving environmental compliance and continual improvement;
- Environmental mitigation measures (such as appropriate erosion and sediment control strategies);
- Consequences of failure to achieve environmental compliance; and
- Reporting environmental incidents to supervisors and participation in the investigation and corrective action required to reduce or remediate environmental harm or the reoccurrence of the incident.

QGC will make all contractors aware of their responsibility to comply with the EMP and relevant EA conditions. As appropriate, contract documents shall indicate that the consultant/contractor is jointly responsible for ensuring EMP and EA compliance.

7.2 Land Access Process

Prior to commencement of QGC activities on a tenement, an internal land access process is carried out. Discussions with landholders and local indigenous groups are undertaken, whose views and opinions are considered when planning well and infrastructure locations. Sign off is required to be obtained from affected persons before works may commence at any site.

The land access process also takes environmental issues into account, such as the location of environmentally sensitive areas, including endangered and of concern regional ecosystems. These areas are avoided with the inclusion of a buffer distance where reasonably practicable.

7.3 Monitoring

Various monitoring and recording methods will be adopted depending upon the nature of the information required. The records will generally be field logs, reinforced where relevant by photographs, incident files, complaint registers, waste registers and geographic information systems data. Sampling and recording of analyses of parameters such as water quality complete the monitoring program.

Works conducted on the tenement will be monitored in accordance with the roles and responsibilities specified for the project. Instruments and devices used for the measurement or monitoring of any parameter as described in this EMP must be calibrated and appropriately operated and maintained.

If monitoring identifies any non-conformances, a corrective action strategy is to be implemented according to the control strategies.

7.4 Monitoring and Assessment of Contaminant Releases/Environmental Impacts

The following section details monitoring programs for air, noise, water and land. These programs have been developed to monitor contaminant releases into the surrounding environment. This is to ensure these releases are within specified levels, and to confirm that the predictions about the expected environmental impacts made at the time of approval are accurate. All monitoring results must be recorded and compiled for a minimum of five years, and made available for inspection upon request by the Environmental Protection Agency.

7.4.1 Air

Value	Contaminant	Location	Frequency	Responsible person	Applicable standard
Air	Nuisance dust	Determined in response to complaint	When requested by administering authority	Analysis conducted by NATA accredited laboratory.	AS 3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method of 1991. Any applicable environmental approval conditions.
	Combustion products	Determined in response to complaint	Determined in response to complaint	Site Manager	N/A
	Odour	Determined in response to complaint	Determined in response to complaint	Site Manager to appoint suitably qualified person	AS4323.3:2001 Stationary source emissions – Determination of odour concentration by dynamic olfactometry.

7.4.2 Noise

Value	Contaminant	Location	Frequency	Responsible person	Applicable standard
Noise	Nuisance noise	Determined in response to complaint.	Determined in response to complaint or by request from administering authority.	Health and Safety Manager to appoint suitably qualified person.	EPA *Noise measurement manual: for use in testing for compliance with the Environmental Protection Act 1994*, 3rd edition March 2000

7.4.3 Water

Value	Contaminant	Location	Frequency	Responsible person	Applicable standard
Surface Water	Sediment	Cut-off drain outlets	After rain events	Site Manager	Any applicable environmental approval condition.
Ground water	TDS	Designated groundwater bores	Quarterly or 6 monthly (as specified in relevant groundwater monitoring program)	Environmental Manger to appoint suitably qualified person.	EPA *Water quality Sampling manual, 3rd edition December 1999.* *ANZECC Water Quality Guidelines 2000* Any applicable environmental approval condition.
	pH				
	Fluoride				
	Sulphate				
	Sodium				
	Chloride				
Associated water	Seepage and loss	Embankment walls	Monthly	Site Manager	Any applicable environmental approval condition.
			Annually	Site Manager to appoint suitably qualified person	Inspection by suitably qualified person and report available for administering authority.
	TDS	Within pond	6 monthly	Environmental Manager to appoint suitably qualified person	EPA *Water quality Sampling manual, 3rd edition December 1999.* *ANZECC Water Quality Guidelines 2000* Any applicable environmental approval condition.
	pH				
	Fluoride				
	Sulphate				
	Sodium				
	Chloride				

7.4.4 Land

Value	Contaminant	Location	Frequency	Responsible person	Applicable standard
Land	Petroleum products and chemicals	Fuel and chemical storage location	Quarterly or when an incident occurs	Site Manager	No staining of soil apparent at storage site. Bunding, etc in compliance with AS 1940 – The storage and handling of flammable and combustible liquids.
	Combustion products	Determined in response to complaint	Determined in response to complaint	Site Manager	Identified weeds to be eradicated using methods nominated by local land care, government agencies or local authorities or landowners.
	Odour	Determined in response to complaint	Determined in response to complaint	Site Manager to appoint suitably qualified person	Visual inspection of wall integrity
	Saline residue	Within pond	At decommissioning	Site Manager to appoint suitably qualified person.	Guidelines for the Assessment of Contaminated Land in Queensland, Environmental Protection Agency (current edition).

7.5 Reporting

When an environmental incident is detected, an Incident Report is generated (Appendix 6). The Incident Report forms are available on QGC's intranet, and must be signed off by the Site Supervisor, Environmental Officer and Environmental Manager. Each incident is entered onto a database, with an Environmental Report produced internally on a regular basis.

QGC shall report any significant environmental issues associated with operational activities in accordance with the requirements of legislation and EA conditions to the EPA and other statutory authorities as appropriate.

As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants at variance, or reasonably assessed to be at variance to the conditions of any licence or authority, or the requirement of the EP Act, the EPA will be notified of the following details;

- the name (or identification) of the holder(s) of the EA;
- the location of the emergency or incident;
- the number of the EA;
- the name and telephone number of the designated contact person;
- the time of the incident;
- the time the EA holder(s) became aware of the incident;
- the suspected cause of the incident;
- the nature of any actual or threatened environmental harm or environmental nuisance caused or suspected to be caused by the incident; and
- actions taken to prevent any further threat or incidents and mitigate any environmental harm or environmental nuisance caused by the incident.

Within 14 days of the initial notification written advice will be given including:

- proposed actions to prevent a recurrence of the emergency or incident;
- outcomes of actions taken at the time to prevent or minimise environmental harm or environmental nuisance; and
- the results of any environmental monitoring performed.

7.6 Conducting Environmental Reviews and Inspections

Environmental audits will be undertaken annually, resulting in the generation of a report assessing compliance with the tenement EA. Environmental inspections are undertaken on operational tenements at intervals of approximately one month, and prior to the establishment of petroleum infrastructure including wells, access tracks and gathering lines.

7.7 Documentation

Any record, monitoring result or document required to be retained in compliance with any condition of the environmental licence, will be held for at least five years. These documents must remain available for examination by any authorised person. Daily and weekly records will be retained for a minimum period of three years. Subsequent to this period, these records are to be archived within QGC.

A copy of this EMP and the environmental licence will be kept in a location readily accessible to persons carrying out the relevant activities on the relevant tenements.

Any complaints that are received are to be documented in the "Complaints Register", where the following information is to be recorded where applicable:

- the location of the issue leading to the complaint;
- the name and telephone number of the person making the complaint;
- the name and telephone number of the designated employee or contractor;
- the time of incident or potential threat;
- the suspected cause;
- the environmental harm and/or environmental nuisance caused, threatened or suspected to be caused; and
- action taken to prevent any further complaints about this issue.

Depending on the nature and extent of the incident or complaint, it may be necessary to notify the relevant regulatory body.

7.8 Review and Update

This EMP is not intended to be a static document and will be subject to periodic review. If at any time the provisions of this EMP are considered to be inadequate, impractical or unreasonable with respect to current or proposed activities, this EMP shall be reviewed and amended as appropriate.

Proposed amendments to this EMP arising from any significant changes to the sites or development plans will be lodged with the EPA and any other relevant statutory body.

8.0 REFERENCES

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Maher, J.M. (ed.), 1996. *Understanding and Managing Soils in the Murilla, Tara and Chinchilla Shires.* Department of Primary Industries Training Series QE96001, Brisbane, Queensland, Australia.

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ATTACHMENT 4 - EXISTING ENVIRONMENTAL CLEARANCE PROCEDURE

Environmental Clearances Procedure

ENVIRONMENT

ENV-PRC-01

1.0 Purpose

Queensland Gas Company (QGC) performs environmental clearances on proposed development sites to ensure their suitability for development. Clearances may be conducted as part of the Land Access process on new sites or as part of the expansion of an existing project and are generally conducted by a field Environmental Officer or a suitably qualified staff member.

2.0 Scope

The purposes of environmental clearances are to:

- Ensure that development meets Environmental Authority requirements
- Assess the environmental aspects of a site and its suitability for development
- Identify significant environmental features of a site that must be protected
- Make recommendations or raise concerns

3.0 Definitions

Pegging Party – Representatives from Environmental, Cultural Heritage, Land Access, Health & Safety and construction carry out a site inspection in order to identify the suitability of the proposed site.

4.0 Process

PROCEDURE	RESPONSIBILITY
1. The Land Access Assistant notifies pegging party members of the need for a clearance. Information provided by the Land Access Assistant includes details for a site visit, GPS co-ordinates, signed consent to entry agreement, remnant vegetation map and an aerial photo.	
2. Available Land Access Representatives will conduct a site visit.	■
3. If the site is immediately identified as unsuitable for cultural or environmental reasons or construction constraints, the center of a well can be moved up to 50m in any direction without having to consult with Geologists.	■

● Every Employee ◆ Managers ■ Supervisors

■ Environmental Officer ✱ Environmental Manager ✖ Operations Co-ordinator

	If the centre of hole will have to be moved further than this, move the site to the preferred location and the Land Access Officer and Construction Supervisor will liaise with the Geologists. For other infrastructure, the Environmental Officer should liaise with the appropriate Construction Supervisor about moving the site.	
4.	Complete the Environmental Approval Field Checklist	■
5.	Peg the four corners of the site and the centre of hole if it is a well. For wells and construction camps the dimensions of the site can be no more that 100 metres by 100 metres.	■
6.	GPS the centre of hole and take photos of the site and surrounding land.	
7.	Flag any trees or features that contractors must avoid with red tape.	■
8.	Upon returning to the office enter all information into the Environmental Approvals Database. This form will document all of the site's environmental features and is an opportunity to raise concerns or make recommendations.	■
9.	Email the completed report and any photographs to the Operations Coordinator and Senior Environmental Officer. The covering email should raise any significant concerns.	■

5.0 Training & Competency Requirements

Environmental Officer

- Knowledge of local flora and fauna species and communities
- Understanding of QGC's Environmental Authority conditions
- Knowledge of soil characteristics and classification
- Knowledge of water management practices and principles
- Ability to read and interpret maps and GPS data, and to use a GPS Unit

6.0 References

Environmental Approval Field Checklist O:\Environment\Environmental Clearances\FieldChecklist.doc

Environmental Clearances Database O:\Environment\Environmental Clearances\Environmental Approvals.mdb

● Every Employee ◆ Managers ■ Supervisors

■ Environmental Officer ✱ Environmental Manager ✖ Operations Co-ordinator

ATTACHMENT 5 - COMPLETED ENVIRONMENTAL CLEARANCE CHECKLIST

Environmental Approval Report

Isabella #2

Date	*Tenement*	*GPS Co-ordinates*	*Conducted By*
7/03/2009	PLA257	295529, 6990912	Jill Melton

Environmental Approval Granted
Yes

Description of Activity
construction of well lease

Size and Dimensions of Site	*EA Clearance*
100m x 100m	Yes

Environmentally Sensitive Areas

Was a protected matter search conducted under the Environmental Protection and Biodiversity Conservation Act?

Yes

Is the site located inside a Category A, B or C Environmentally Sensitive Area?

No

Is the site located within 1 km of a Category A Environmentally Sensitive Area (National and Conservation Parks, Forest Reserves etc)?

No

Is the site located within 500 m of a Category B Environmentally Sensitive Area (Endangered Regional Ecosystems, State Forest Park, Culturally significant areas, conservation areas etc)?

No

If the site is located inside a Category C Environmentally Sensitive Area(State Forest, State Wildlife Corridors, 'Declared Areas', etc), has approval been granted through the relevant administering authority?

N/A

Endangered Regional Ecosystems

If there is no reasonable alternative and the site is located in or within the 500m buffer zone of an Endangered Regional Ecosystem, can the site be located (ranked in preference)

1. ☐In pre existing areas of significant disturbance in the buffer zone?

N/A

2. □In undisturbed areas within the buffer zone?

N/A

3. □In pre existing areas of disturbance within the ERE?

N/A

4. Iin EREs of less significance (areas mapped as remnant not of concern or remnant of concern)

N/A

5. □If clearing is unavoidable with the ERE, will the cleared area be less than 10% of the mapped ERE and will mature trees be avoided?

N/A

Water Courses

Is the site within 150 m of the high bank of a water course?

Yes

What is the approximate distance to a watercourse?

100m

Is the site within 150 m of the static high water mark of wetlands, lakes or springs?

No

What is the approximate distance to a body of water?

Vegetation

Will the site dissect (break of more than 50m) or isolate clumps or corridors of vegetation?

Yes

What are the dominant plant species on the site?

Cypress pine, bulloak, gum topped ironbark, red gum.

Weeds

Weed species present on the site and surrounds:

Prickly pear

Noise

Background Noise Level: NA

Slope and Soils

Is the natural slope of the site greater than 3%?	*What is the approximate slope of the site?*
No	1-2

Does the site have dispersible soils (clay material disintegrates into particles less that 2 microns across)?

No

What is the basic soil type?

sandy

Is the site on an existing or potential discharge area (Groundwater movement within 2-5m of the surface or subject to upward movement)?

No

Environmental Advice

Centre of hole moved to avoid watercourse. Ensure lease is bunded on the NW side to prevent any contamination in the waterway. Keep cleared area as small as possible.

Environmental Approval Report

Isabella #3

Date	*Tenement*	*GPS Co-ordinates*	*Conducted By*
7/03/2009	PLA275	296292, 6990080	Jill Melton

Environmental Approval Granted
Yes

Description of Activity
Construction of well lease

Size and Dimensions of Site	*EA Clearance*
100m x 100m	Yes

Environmentally Sensitive Areas

Was a protected matter search conducted under the Environmental Protection and Biodiversity Conservation Act?

Yes

Is the site located inside a Category A, B or C Environmentally Sensitive Area?

No

Is the site located within 1 km of a Category A Environmentally Sensitive Area (National and Conservation Parks, Forest Reserves etc)?

No

Is the site located within 500 m of a Category B Environmentally Sensitive Area (Endangered Regional Ecosystems, State Forest Park, Culturally significant areas, conservation areas etc)?

No

If the site is located inside a Category C Environmentally Sensitive Area(State Forest, State Wildlife Corridors, 'Declared Areas', etc), has approval been granted through the relevant administering authority?

N/A

Endangered Regional Ecosystems

If there is no reasonable alternative and the site is located in or within the 500m buffer zone of an Endangered Regional Ecosystem, can the site be located (ranked in preference)

1. ☐In pre existing areas of significant disturbance in the buffer zone?

N/A

2. □In undisturbed areas within the buffer zone?

N/A

3. □In pre existing areas of disturbance within the ERE?

N/A

4. Iin EREs of less significance (areas mapped as remnant not of concern or remnant of concern)

N/A

5. □If clearing is unavoidable with the ERE, will the cleared area be less than 10% of the mapped ERE and will mature trees be avoided?

N/A

Water Courses

Is the site within 150 m of the high bank of a water course?

No

What is the approximate distance to a watercourse?

500m

Is the site within 150 m of the static high water mark of wetlands, lakes or springs?

No

What is the approximate distance to a body of water?

unsure

Vegetation

Will the site dissect (break of more than 50m) or isolate clumps or corridors of vegetation?

Yes

What are the dominant plant species on the site?

Bulloak, poplar box

Weeds

Weed species present on the site and surrounds:

no declared weeds sighted

Noise

Background Noise Level: NA

Slope and Soils

Is the natural slope of the site greater than 3%?	*What is the approximate slope of the site?*
No	1-2

Does the site have dispersible soils (clay material disintegrates into particles less that 2 microns across)?

No

What is the basic soil type?

sandy

Is the site on an existing or potential discharge area (Groundwater movement within 2-5m of the surface or subject to upward movement)?

No

Environmental Advice

keep cleared area as small as possible, and avoid clearing large trees wherever practicable. A 10m vegetation buffer will be left around the lease for visual amenity.

Environmental Approval Report

isabella #4

Date	*Tenement*	*GPS Co-ordinates*	*Conducted By*
7/03/2009	PLA275	295522, 6990176	Jill Melton

Environmental Approval Granted
Yes

Description of Activity
construction of well lease

Size and Dimensions of Site
100m x 100m

EA Clearance
Yes

Environmentally Sensitive Areas

Was a protected matter search conducted under the Environmental Protection and Biodiversity Conservation Act?

Is the site located inside a Category A, B or C Environmentally Sensitive Area?

No

Is the site located within 1 km of a Category A Environmentally Sensitive Area (National and Conservation Parks, Forest Reserves etc)?

No

Is the site located within 500 m of a Category B Environmentally Sensitive Area (Endangered Regional Ecosystems, State Forest Park, Culturally significant areas, conservation areas etc)?

No

If the site is located inside a Category C Environmentally Sensitive Area(State Forest, State Wildlife Corridors, 'Declared Areas', etc), has approval been granted through the relevant administering authority?

N/A

Endangered Regional Ecosystems

If there is no reasonable alternative and the site is located in or within the 500m buffer zone of an Endangered Regional Ecosystem, can the site be located (ranked in preference)

1. ☐In pre existing areas of significant disturbance in the buffer zone?

N/A

2. □In undisturbed areas within the buffer zone?

N/A

3. □In pre existing areas of disturbance within the ERE?

N/A

4. Iin EREs of less significance (areas mapped as remnant not of concern or remnant of concern)

N/A

5. □If clearing is unavoidable with the ERE, will the cleared area be less than 10% of the mapped ERE and will mature trees be avoided?

N/A

Water Courses

Is the site within 150 m of the high bank of a water course?

No

What is the approximate distance to a watercourse?

500m

Is the site within 150 m of the static high water mark of wetlands, lakes or springs?

No

What is the approximate distance to a body of water?

unsure

Vegetation

Will the site dissect (break of more than 50m) or isolate clumps or corridors of vegetation?

No

What are the dominant plant species on the site?

Cleared for pasture. Two mature cypress pines exist in the corner of the lease that should remain as shade trees if possible.

Weeds

Weed species present on the site and surrounds:

African lovegrass

Noise

Background Noise Level: NA

Slope and Soils

Is the natural slope of the site greater than 3%?	*What is the approximate slope of the site?*
No	0-1

Does the site have dispersible soils (clay material disintegrates into particles less that 2 microns across)?

No

What is the basic soil type?

sandy

Is the site on an existing or potential discharge area (Groundwater movement within 2-5m of the surface or subject to upward movement)?

No

Environmental Advice

Washdowns will be required for lease construction equipment due to the presence of African lovegrass on this lease. Please see environmental staff for weed declarations and inspections.

ATTACHMENT 6 - CURRICULA VITAE

Ann Moran

Principal Field Botanist / Ecologist

Profile

Ann is the Owner and Director of a small environmental business and has over 20 years experience in environmental assessment, property management plans and mine rehabilitation in Queensland and the Northern Territory. She provides her expertise to Community Group Education with Land for Wildlife, Coast Care programs, nature conservation and catchment management programs. Ann initiates strategies and guidelines for sustainable development and the protection, enhancement and rehabilitation of species and regional ecosystems

Qualifications

Bachelor of Science (Environmental)	University of the Sunshine Coast
Train the trainer courses CN404 Instructional Skills	Cooloola Sunshine Coast Institute of TAFE
Regional Ecosystem Assessment and Accreditation	

Affiliations

Greencorp

TAFE Greening Australia Community Group training

Department of Natural Resources

Awards

Australian Federation of University Women Sunshine Coast Branch Science Faculty Award: USC Maroochydoore Shire Bicenential Foundation Award 1992 – Pursuit of excellence for outstanding achievements in Biology

Scientific permit: No. WISP01050603 from EPA – DPI certificate no.85

Areas Of Expertise

- Environmental surveys, monitoring and mapping
- Environmental policy and planning development and review
- Biodiversity, conservation significance and environmental impact assessment
- Biodiversity Mapping fauna corridors, foreshores, vegetation, waterways and weeds
- Environmental monitoring for Developments and Councils

Relevant Experience

- Biodiversity Mapping Methodology and Ecological Assessments
- Landscape plans Environmental Management Plans
- Weed Management and Environmental monitoring Programs
- Vegetation Management retention of vegetation communities
- Rare and Threatened species and related issues
- Flora and Fauna surveys, Vegetation and species mapping (GIS & GPS)
- Prepare and post auditing under power line for tree removal throughout Queensland
- Assessed several optional routes for (Main Road, Water and Gas pipeline)
- NHT Panel assessing community projects and catchment management initiatives
- Review and verifying Regional Ecosystems in Caboolture and other shires
- Monitoring recreational use and impacts on migratory and resident shorebirds of the Noosa North Shore
- Design and implementation of Greening Brisbane re-vegetation project

Bruce Thomson

Senior Ecologist

Profile

Bruce Thomson is a senior ecologist and biodiversity planner with extensive experience in a broad range of biological field survey, research environmental management, concept planning, project proposal and development and conservation disciplines. Has worked as a professional botanist, wildlife researcher and conservation manager and has managed scientific and technical staff (project management) and associated budgets and work programs. Government and university background with experience in fauna consultancy work for the mining industry. Bruce has conducted field surveys throughout the Northern Territory for the NT Herbarium and also the Wildlife Research Unit of the Conservation Commission of the NT. He has also conducted wildlife surveys in southeast Queensland for the Queensland Parks and Wildlife Service.

Qualifications

PhD "Social ecology of the Chocolate Wattled Bat, *Chalinolobus morio*, in southeast Queensland	University of Queensland
Masters of Business Administration (Marketing, Public Sector & Strategic Management)	University of New England NSW
Bachelor of Applied Science (Natural Resource Management)	University of Canberra, ACT

Papers & Publications

Thomson, B.G., Witts, S. & Martin, P. (1979) Niche Separation in Three Species of Water Birds on Sullivans Creek, A.C.T. *Corella* Vol. 1 (3). RAOU

Thomson, B.G. (1982) Records of *Eptesicus vulturnus* (Thomas) (Vespertilionidae: Chiroptera) from the Alice Springs Area, Northern Territory. *Aust. Mammalogy* Vol. 5: 69 - 70

Thomson, B.G. (1989) *A Field Guide to the Bats of the Northern Territory.* Conservation Commission of the N.T., Alice Springs

Thomson, B.G. & Kube, P.D. (1990) *Arid Zone Eucalypts of the Northern Territory,* Botanical Bulletin No.9, Conservation Commission of the N.T

Thomson, B.G. (1990) Response to Les Hall (Bat Conservation). *Australian Zoologist* Vol. 26 (2): 40

Gibson, D., Cole, J. & Thomson, B. (1991) *A Biological Survey of Loves Creek Station, N.T.,* Conservation Commission of the N.T., Alice Springs

Gibson, D., Cole, J. & Thomson, B. (1992) *A Biological Survey of the West Macdonnell Ranges, N.T.* Conservation Commission of the N.T., Alice Springs

Thomson, B.G. & Latz, P.K. (1992) Botany in *Flora and Fauna of the Sir Edward Pellew Group of Islands,* Conservation Commission of the N.T. (internal report)

Thomson, B.G. (1992) Three New Species of *Euphorbia* L. subgenus *Chamaesyce* Millsp. (Euphorbiaceae) from Central and Northern Australia. *Nuytsia* 8 (3): 1-10

Ginns, A., Hay, P. & Thomson, B. (1992) *Concept Plan for the Desert Flora and Fauna Park, Alice Springs, N.T.* Conservation Commission of the N.T., Alice Springs

Richards, G., Hall, L., Hoye, G., Lumsden, L., Parnaby, H., Reardon, T., Strahan, R., Thomson, B. and Tidemann, C. (1993) A Revision of the Inventory and English Names of Australian Bats. *Australian Bat Society Newsletter* 2: 8 - 15, July ' 93

Thomson, B.G. (1995) *Vespadelus caurinus* (species account) in Strahan (ed.) *Complete Book of Australian Mammals,* 2nd. Edn. Reed/ Australian Museum, Sydney

Thomson, B.G. (1995) *Euphorbia* L. *in* Dunlop, C. & Leach G. & Cowie, I.D. *Flora of the Darwin Region* Vol.2. Conservation Commission of the N.T

Thomson, B.G. (1997) *Defunct Coal Mine Goes Into Bat for Tourists.* Qld Government Mining Journal (Sept), Qld Department of Mines and Energy, Brisbane

Thomson, B., Clague, C., Ellis, M. Schulz, M. and Young A. (1999) *Little Pied Bat* in Duncan, Baker and Montgomery (eds) *Action Plan for Australian Bats*, Environment Australia, Canberra

McKenzie, N., Reardon, T. and Thomson, B. (1999) *Central Long-eared Bat* in Duncan, Baker and Montgomery (eds) *Action Plan for Australian Bats*, Environment Australia, Canberra

McKenzie, N., Schulz, M., and Thomson, B. *Northern Leaf-nosed Bat* in Duncan, Baker and Montgomery (eds) *Action Plan for Australian Bats*, Environment Australia, Canberra

Thomson, B.G. and Ducummon S. (1999) *Bats in Australia's abandoned mines: a cooperative approach for integrating bat conservation and mine land reclamation* in Proceedings of the 24th Annual Environmental

Bruce Thomson

Senior Ecologist

Workshop, Minerals Council of Australia, Townsville

Thomson, B.G. (1998) *Cooperation to protect rare Cape York Bats*, Qld Government Mining Journal (July), Qld. Department of Mines and Energy, Brisbane

Thomson, B.G. (1999) *Management - Bats in Old Mines*. Journal of Mining, Environmental Management, November: 15-19. Mining Journal Publication, Great Britain

Thomson, B.G. (2004) Conservation Management of Cave-dwelling Bats in *Protected Area Management (Principles and Practices)*. Oxford University Press

Thomson, B.G., Reardon, T. and Pavey, C. (2004). *Recovery plan for cave-dwelling bats - Rhinolophus philippinensis, Hipposideros semoni and Taphozous troughtoni* 2000 -2005. Report to Department of the Environment and Heritage, Canberra. Queensland Parks and Wildlife Service, Brisbane

Thomson, B.G. (2006) *Australia's Most Deadly and Dangerous Beasts*, Lothian Publishers, Melbourne

Shulz, M and Thomson,B (2007) National Recovery Plan for the Bare-rumped Sheathtail Bat, Saccolaimus saccolaimus. Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane

Career Summary

2003 – Current	Queensland Parks and Wildlife Service - Senior Conservation Officer (Central Office Secondment) - Bat conservation and policy development
1993 – 2002	Queensland Parks and Wildlife Service - Senior Conservation Officer (Management Planning)
1983 – 1993	Wildlife Research Section, Conservation Commission of the Northern Territory, Alice Springs - Officer in Charge, Northern Territory Southern Regional Herbarium
1981 – 1983	Northern Territory Herbarium, NT Department of Primary Production, Alice Springs - Scientific Research Officer, P2
1979 – 1981	Wildlife Research Section, Territory Parks and Wildlife Commission, Alice Springs - Technical Assistant T2

Areas Of Expertise

- Collection and identification of botanical specimens
- Elliott and large cage trapping and pit fall trapping of small mammals, reptiles and arthropods
- Collection of nocturnal insects using mercury vapour lamps
- Collection and identification of small mammal bone material from Owl pellets and excavated cave floor deposits
- Extensive involvement with Aboriginal Traditional Owners in fauna survey work in the NT
- Bat survey using mist nets, bat traps, water trip lines and echo-location call analysis
- Bird surveys using transect methodologies and anecdotal observations
- Anecdotal observations of wildlife and active searching techniques with spotlights and binoculars etc
- Recording of wildlife with automated camera systems (built by Bruce Thomson)

Relevant Experience

Flora

- Conducted botanical surveys and provided species inventories and biodiversity assessments for numerous development proposals including the Yulara development at Ayers Rock, and acquisition planning for national parks such as Kings Canyon NP, Gregory NP on the Victoria River and parts of the Tanami Desert. A number of my botanical collections are type specimens for newly recognised species
- Monitored and conducted ecological studies on two species of rare and endangered plants; a rare palm *Livistona mariae*, in Finke Gorge National Park and a rare shrub *Eremophila prostrata* in Rainbow Valley Conservation Reserve (NT)
- I conducted taxonomic research into the genus *Euphorbia* across Australia and described two new species from the northern parts of WA
- I curated the NT Herbarium, providing plant identifications and advice to herbarium clients, and also undertook standard maintenance activities for the collection

	including the supervision of the herbarium computer database and updating and review of taxonomic nomenclature as required
Fauna	• I was involved in the initial capture and captive breeding of the Bilby and Rufous Hare Wallaby (Alice Springs, NT) and conducted dietary studies of the Bilby through faecal analysis • Academic supervision of Masters research project on bat roosting ecology, University of New England (Honorary Research Associate) • Researched the behaviour of bats when negotiating steel grills (on mine entrances) and developed compatible gate designs for the protection of cave and mine sites for cave-dwelling bat species. I successfully gained funding from the mining industry environmental representative body to study mine land rehabilitation in the United States • Conducted flying fox taste and smell deterrent chemical trials for fruit crop protection in conjunction with the Qld DPI and the Queensland Fruit and Vegetable Growers Ltd • Research into the social ecology of the Chocolate Wattled Bat (PhD) using a range of techniques; implanting passive integrated transponder tagging (“microchips”), designing and installing tag reader systems, measuring and analysing microclimate data and conducted structured observational investigations of animal behaviour • I have conducted genetic research using PCR protocols, sequencing and standard analysis using specialised programs such as PAUP, Sequencher and Arlequin, at the Queensland Biosciences Precinct University of Queensland, St Lucia
Conservation Management	• Researched and developed concept plans and project proposals for the sustainable development of tourism on Queensland Park’s estates. The process normally involves close liaison with major stakeholders – local councils, park staff, tour operators and local business; an assessment of market size, demand and product requirements; assessment of conservation values and resilience of the environment to sustain development, eg. development proposals for Coominglah State Forest . I was co-author of the original concept plan for the multi-million dollar, Alice Springs Desert Park, Member of the Steering Committee for the Yulara development at Ayers Rock • Developed and assisted implementation of conservation planning strategies for the management of National Parks in southeast Queensland – conservation management of rare and threatened species, feral animals and weed control strategies, fire management and national park visitor impacts and management. I have also developed monitoring programmes to assess long term trends in resource condition in relation to the above issues; fauna monitoring programmes for the Bunya Mountains National Park in southeast Queensland, feral animal assessments, fire monitoring • Setup on-ground conservation measures to protect roosting habitat for rare and threatened bat species in abandoned mines. Negotiated workable protection measures with other stakeholders including the Department Mines and Energy, Burgowan Colliery near Hervey Bay and Jibinbar State Arsenic Mine near Stanthorpe. Subsequently, DME included amendments to their Guidelines for Hardrock Drilling to endorse the use of these techniques for adit closures (gating) across the State • Designed and provided advice on the construction of several experimental ‘artificial caves’ at Riverton (by DML Lime Pty Ltd), North Stradbroke Island (by CRL Pty Ltd) and Manumbar (D’Angular Gold Pty Ltd) mining areas • Developed a collaborative conservation plan with Rosalie Shire Council in southeast Queensland, to protect an historic railway tunnel which houses a large population of bent-wing bats each winter. The agreement provides for the use of the tunnel by

visitors during summer. The main section of the tunnel is closed by gates during winter to protect the bats

- Developed a Species Recovery Plan for three species of Qld endangered bats under Australian Government guidelines. I coordinated input from recovery team members: Qld Department of Mines and Energy, Department of Natural Resources, community groups such as the Central Queensland Speleological Society and Chillagoe Caving Club, and research staff from the University of Queensland and elsewhere. Other groups consulted were the Wildlife Preservation Society of Qld and Balkanu Cape York Development Corporation (Aboriginal)
- Developed a cooperative program to address abandoned mine gating between QPWS, NSW Parks and Wildlife Service and the Victorian Department of Conservation and Natural Resources. The program will facilitate information exchange and cost share the development of a mines database and staff training materials
- Negotiated and implemented an ongoing, cooperative research program between the then Conservation Commission of the NT and the University of Sydney to conduct botanical and invertebrate research on central Australian parks

Other Scientific Services – advisory and public relations

- After representations to fruit growers at packing shed meetings in 1998, I was invited to become a founding member of the Queensland Government's Flying Fox Consultative Committee to explore options for flying fox management on fruit crops. I was a scientific advisor on this panel
- Provided advice to the Melbourne Botanic Gardens in respect of their flying fox dilemma and also the Sydney Botanic Gardens, Mt Isa and numerous local authorities in the greater Brisbane area
- In the NT, I provided a range of botanical services to the Conservation Commission of the NT and the Department of Primary Production. These services related to the identification of plants, their distributional range and abundance, chemical content (poisons), aboriginal usage and basic ecology; environmental management of rare and endangered fauna, fire, weeds, feral animal damage and control of human impacts on the Conservation Commission's protected area estate

Communication

- I have negotiated conservation outcomes in difficult situations with potentially hostile stakeholders, as in the case of fruit growers and flying foxes and grazing lessees in State Forests. I have worked closely with Aboriginal groups, both in the field and office, to conduct surveys and involved these important stakeholders in conservation management deliberations
- I have presented scientific and conservation papers at Australian and International scientific conventions and I am an invited speaker at the 2007 International Bat Conference in Mexico
- I have written numerous documents, from survey reports, to ministerial briefing notes and popular publications. Please see the attached list of publications for further details of published reports and documents
- Provided high level advice to senior government departmental staff; regional directors, regional and district managers with respect to conservation management and the strategic management of protected areas. I have conducted workshops and seminars on these topics and have also provided regional representation to head office in relation to conservation issues
- I have provided TV interviews for news reports on weed species (Local WIN TV) and appeared in documentaries and children's programs such as Totally Wild (Ch10) and provided interviews to ABC and regional radio networks, to promote conservation

Administrative and Financial

- Have supervised up to 6 staff, including 3 professional level positions and have administered budgets up to $150,000. I have successfully applied for numerous

grants and administered them to the complete satisfaction of the sponsors; C'th Endangered Species grants from $5,000 to $20,000, RIRDC grants of $20,000 and C'th ABRS grants of $35,000

- Prepared position descriptions, advertised, interviewed and appointed technical, research and field staff with the NT Department of Primary Industries and the Queensland Environmental Protection Agency
- I have managed staff and built effective team environments, developed work programmes and performance measures with team members. I have formal qualifications in HRM through my MBA
- With Queensland Parks and Wildlife Service (QPWS), I have actively participated in the Departments Enterprise Bargaining (E.B. Focus Group member), EEO matters and the development of Departmental Code of Conduct
- I coordinated the QPWS regional industrial placement program for students from University of Queensland to undertake business-related work programmes
- Applied for and negotiated EPA License (Integrated Environmental Management System) for the QPWS Southern Region's protected area estate (toilets and other facilities) as per the Environmental Protection Act 1995. Organised implementation of license conditions
- Coordinated and supervised the preparation of plans of management for the QPWS protected area estate in Southern Region. This is essentially a strategic planning exercise, applied to national parks
- Supported and trained all Regional field staff involved in management and strategic planning activities

ATTACHMENT 7 – TERTIARY SITE VEGETATION ASSESSMENT DATA SHEETS

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T01 KP: JAMMAT Assessor: Ann Moran Date : 17/07/2008

Location: WAMBO CK Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 258934…….. Northing: 7011732……Waypoint #: ……..

Width of RE: 150-300m

Width of total remnant: >300

Total RE Area: Does not extend beyond site; >50ha

Total remnant Area: Does not extend beyond site; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.4/11.5.1		Of Concern/Not of Concern
Survey result	11.3.4/11.5.1		Of Concern/Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 80 %

Canopy Median Height: 25 m. Structural Code: Tall Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus tereticornis	C	30	20		8			
Callitris glaucophylla	C		20	10	8			
Juncus continuus	C							1
Angophora floribunda	C	30			8			
Leptospermum polygalifolium	C					5	2	
Eucalyptus populnea	E			15				
Verbena tenuisecta	E							1
Lomandra leucocephala	O							1
Lomandra longifolia	O							1
Corymbia tessellaris	O				8			
Aristida caput-medusae	O							
Arundinella nepalensis	O							
Acacia leptostachya	P					5		
Cyperus polystachyos	U							1
Phragmites australis	U							1
Setaria pumila ssp pallide-fusca	U							1
Canopy stratum (%)								70
Mid stratum (%)								30
Ground stratum (%)								90
Rock cover (%)								
Bare ground cover (%)								10
Litter cover (%)								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants
Bryophyllum tubiflorum Mother of millions
Verbena tenuisecta Maynes Pest

Weed Cover (%): <5

Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow;

Soil Texture: sandy loam;

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Watercourse
……
……

Special conservation significance: Creek line in good condition
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops Grazing

Other notes: Erosion issuses

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……..

Site Number: T02 KP: …….. Assessor: Ann Moran Date : 17/07/2008

Location: Bennett's School Road Photo #: 238-239

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 246016 Northing: 7004691 Waypoint #: ……..

Width of RE: <35m wide

Width of total remnant: <35m wide

Total RE Area: >50ha

Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.1		Not of Concern
Survey result	11.5.1		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%

Canopy Median Height: 15m. Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Allocasuarina luehmannii	A		20	15	8			
Acacia buxifolia ssp buxifolia	C					3	2	
Eucalyptus crebra	C		20	15				
Callitris glaucophylla	O			10	8	5		
Angophora leiocarpa	O			15				
Aristida leptopoda	O							1
Sporobolus fertilis	O							1
Pultenaea microphylla	U							1
Lomandra longifolia	U							1
Acacia crassa ssp crassa	P					5		
Melaleuca decora	P					5		
Cymbidium canaliculatum	R							
Acacia spectabilis	E						2	
Canopy stratum (%)								70
Mid stratum (%)								30
Ground stratum (%)								5
Rock cover (%)								
Bare ground cover (%)								80
Litter cover (%)								15

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia tomentosa Prickly Pear

Weed Cover (%): <5

Disturbance (% of site affected): <1

Health: Average

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow;

Soil Texture: sandy clay loam;

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes:

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T03 KP: Owen Assessor: Ann Moran Date : 18/07/2008

Location: Sixteen Mile Creek Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 262834 Northing: 7018123
Width of RE: 35-75m
Width of total remnant: 35-75m
Total RE Area: Does not extend beyond site; >50ha
Total remnant Area: Does not extend beyond site; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.4/11.3.2/ 11.3.25		Of Concern/Of Concern/ Not of Concern
Survey result	11.3.4/11.3.2 edge		Of Concern/Of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20.m. Structural Code: Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus populnea	C			10	8			
Eucalyptus tereticornis	C	30	25		8			
Leptochloa digitata	C							2
Callitris glaucophylla	O			10	8			
Acacia buxifolia ssp buxifolia	O						4	
Eremophila mitchellii	O					6	4	
Angophora floribunda	O		20					
Aristida ramosa v ramosa	O							1
Sporobolus fertilis	O							1
Geijera parviflora	O						2	
Tetragonia tetragonioides	P							1
Capparis mitchellii	P						2	
Hypoxis hygrometrica v villosisepala	P							1
Acacia excelsa ssp excelsa	P						2	
Imperata cylindrica	P							1
Brunoniella australis	U							1
Casuarina cunninghamiana	U		25					
Juncus continuus	U							1
Lomandra longifolia	U							1
Acacia leptostachya	U					4		
Acacia omalophylla	U					4		
Acacia salicina	U					4		
Aristida leptopoda	U							1
Arundinella nepalensis	U							1
Bothriochloa decipiens v decipiens	U							1
Cynodon dactylon	U							1
Phragmites australis	U							1

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants
Tree pear
Mother of Millions

Weed Cover (%): <5

Disturbance (% of site affected): <1;

Health: Average

Slope: Lower slope; Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow;

Soil Texture: sandy clay;

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erosion
……

Special conservation significance: Degraded heavily grazing
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops Grazing

Other notes: Erosion and heavy Trampling on Creekbanks

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T04 KP: …… Assessor: Ann Moran Date : 18/07/2008

Location: Site 4 Photo #: in GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 267930 Northing: 7016673
Width of RE: >300
Width of total remnant: >300
Total RE Area: Does not extend beyond site; 1-5ha;
Total remnant Area: Does not extend beyond site; 1-5ha;

	RE code	EPBC status	VMA status
DNRW RE map	11.3.4/ 11.5.1		Of concern/ Not of concern
Survey result	11.3.26		Not of concern

Canopy stratum form: Tree; Canopy Crown Cover: 80%
Canopy Median Height: 20 m. Structural Code: Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus moluccana	D		20	15	10			
Brunoniella australis	O							<1
Calotis dentex	O							<1
Dianella revoluta v revoluta	O							<1
Aristida caput-medusae	O							<1
Aristida leptopoda	O							<1
Enteropogon acicularis	O							<1
Eragrostis leptostachya	O							<1
Panicum subxerophilum	O							<1
Paspalidium caespitosum	O							<1
Gahnia aspera	P							<1
Goodenia glabra	P							<1
Digitaria divaricatissima	P							<1
Juncus planifolius	U							<1
Lomandra longifolia	U							<1
Eragrostis sororia	U							<1
Acacia harpophylla	E			15				
Canopy stratum (%) 80%								
Mid stratum (%) 20%								
Ground stratum 30 %								
Rock cover (%)								
Bare ground cover (%) 60 %								
Leaf litter (%) 10 %								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia tomentosa Prickly pear

Weed Cover (%): <5

Disturbance (% of site affected): <1;

Health: Average

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: grayish;

Soil Texture: silty clay loam;

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Monoculture patch logged in the past 50 years old

Special conservation significance: On this property - Greening Australia as Land Management Areas set aside for wildlife

Other notes: Remnant edged with Endangered Regional Ecosystem 11.3.1 which is not larger enough to map only 5-10 meters wide.

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T05 KP: …… Assessor: Ann Moran Date : 18/07/2008

Location: Graham Road near Braemar Power Station Photo #: .240-244

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 291443 Northing: 6998120

Width of RE: 75-150m ;
Width of total remnant: 75-150m ;
Total RE Area: 1-5ha;
Total remnant Area: 1-5ha;

	RE code	EPBC status	VMA status
DNRW RE map	11.7.7/11.7.4/11.7.5		Not of Concern/Not of Concern/ Not of Concern
Survey result	11.7.7/11.7.5		Not of Concern/Not of Concern

Canopy stratum form: Shrub Canopy Crown Cover: 80%
Canopy Median Height: 2 m. Structural Code: Woodland Regrowth

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Callitris glaucophylla	C			10				
Acacia crassa ssp crassa	E					5		
Eucalyptus crebra	C		15					
Eucalyptus exserta	C			10				
Aristida caput-medusae	C							<1
Calyptochloa gracillima	C							<1
Acacia shirleyi	O				8			
Eucalyptus fibrosa ssp nubilis	E	20						
Aristida leptopoda	O							<1
Philotheca sporadica	O						1	
Angophora leiocarpa	P				8			
Acacia conferta	U						*2*	
Aristida benthamii v spinulifera	U							<1
Micromyrtus sp	U						2	
Canopy stratum (%)								30
Mid stratum (%)								50
Ground stratum (%)								20
Rock cover (%)								80
Bare ground cover (%)								
Litter cover (%)								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes *Philotheca sporadica*
Collected sample
Additional notes on pest plants

Weed Cover (%): <5

Disturbance (% of site affected): <1;

Health: Average

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow;

Soil Texture: stony;

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):
Cut by power line easement running through the back of the property

Special conservation significance: ERV Species present

observed or Horticultural Crops Past Logging and power line easement running through the back

Other notes: *Philotheca sporadica* found on both sides the length on the road dominant in the State Forest next door
Micromytus species to by Identified

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T06 KP: …… Assessor: Ann Moran Date : 18/07/2008

Location: Banana Bridge Road Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 275706 Northing: 7019683

Width of RE: 75-150m
Width of total remnant: 75-150m
Total RE Area: 20-50ha
Total remnant Area: 20-50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.20/11.5.1/11.5.1a		Not of Concern
Survey result	11.5.1		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 30-50%
Canopy Median Height: 15 m Structural Code: Mixed Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus crebra	C		20					
Eucalyptus populnea	C			15				
Callitris glaucophylla	O			15				
Corymbia trachyphloia	O			15				
Acacia crassa ssp crassa	O				6			
Einadia nutans ssp nutans	O							<1
Panicum subxerophilum	O							<1
Acacia leiocalyx	P				6			
Angophora leiocarpa	P			15				
Allocasuarina luehmannii	P				8			
Paspalidium albovillosum	P							<1
Brunoniella australis	U							<1
Aristida leptopoda	U							<1
Aristida vagans	U							<1
Digitaria divaricatissima	U							<1
Boronia bipinnata v bipinnata	E						1	
Calyptochloa gracillima								<1
Canopy stratum (%)								50
Mid stratum (%)								80
Ground stratum (%)								60
Rock cover (%)								
Bare ground cover (%)								20
Litter cover (%)								20

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia tomentosa Prickly Pear

Weed Cover (%): <5

Disturbance (% of site affected): <1;

Health: Average

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow;

Soil Texture: sandy clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:..……

observed or Horticultural Crops Logging in the pasts

Other notes: Swats of Rabbits observed

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T07 KP: …… Assessor: Ann Moran Date : 19/07/2008

Location: Montrose Road Tara Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 263562 Northing: 7008961

Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.1a		Not of Concern
Survey result	11.5.1a		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Woodland on Ecotone

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus piligaensis	C	25	20		8			
Eucalyptus fibrosa ssp nubilis	E	25	20		8			
Eucalyptus populnea	E		20					
Brunoniella australis	O							<1
Allocasuarina luehmannii	O			10	8			
Callitris glaucophylla	O			10			2	
Eragrostis leptocarpa	O							
Sporobolus fertilis	O							<1
Geijera parviflora	O						2	
Fimbristylis dichotoma	P							<1
Lomandra longifolia	P							<1
Cymbopogon refractus	P							<1
Acacia excelsa ssp excelsa	U							
Dianella revoluta v revoluta	U						3	<1
Aristida leptopoda	U							<1
Themeda triandra	U							<1
Canopy stratum (%)								70
Mid stratum (%)								20
Ground stratum (%)								70
Rock cover (%)								
Bare ground cover (%)								20
Litter cover (%)								10

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Nil

Weed Cover (%): 0

Disturbance (% of site affected): 0

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow

Soil Texture: silty loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
……

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Ecotonal Roadside

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T08 KP: WYALLA Assessor: Ann Moran Date : 19/07/2008

Location: SCHLOSS RD Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 263565 Northing: 7008962

Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.1	Endangered	Endangered
Survey result	11.3.1	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Acacia harpophylla	A		20	15	10	5		
Tetragonia tetragonioides	O							1
Einadia nutans ssp nutans	O							1
Enchylaena tomentosa v tomentosa	O							1
Digitaria divaricatissima	O							1
Zygophyllum apiculatum	O							1
Cyperus bifax	U							1
Geijera parviflora	U						2	
Sarcostemma viminale	P					3		
Hypoxis hygrometrica v villosisepala	P							1
Marsilea hirsuta	P							1
Dianella revoluta v revoluta	P							1
Santalum lanceolatum	P					3		
Alectryon diversifolius	P						2	
Canopy stratum (%)								70
Mid stratum (%)								30
Ground stratum (%)								10
Rock cover (%)								
Bare ground cover (%)								10
Litter cover (%)								80

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Atriplex muelleri
Salsola kali
Cenchrus ciliaris
Urochloa mosambicensis
Verbena tenuisecta

Weed Cover (%): 5-25 %

Disturbance (% of site affected): 1-5 %

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: dark brown

Soil Texture: sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
Used as rubbish dumping ground lot of human litter

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops Grains

Other notes: All dirt roadside weeds mainly Buffel Grass Many dead tree throughout remnant

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……..

Site Number: T09 KP: …….. Assessor: Ann Moran Date : 19/07/2008

Location: Wyalla Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 272326 Northing: 7024304

Width of RE: <35
Width of total remnant: <35
Total RE Area: <1 ha
Total remnant Area: <1 ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.20/11.3.3		Not of Concern
Survey result	11.5.20/11.5.16		Not of Concern/Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Woodland on Ecotone

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Casuarina cristata	C		20	15				
Acacia harpophylla	C		20	15	8			
Eucalyptus piligaensis	C	25	20					
Santalum lanceolatum	C					3		
Carissa ovata	O						2	
Acacia deanei ssp deanei	O						2	
Eremophila mitchellii	O					3		
Myoporum acuminatum	O					3		
Paspalidium caespitosum	O							1
Geijera parviflora	O					3		
Dodonaea viscosa ssp spatulata	O						2	
Cymbopogon refractus	U							1
Enteropogon acicularis	U							1
Senna occidentalis	P						2	
Capparis lasiantha	P						2	
Jasminum didymum ssp didymum	P							1
Citrus glauca	P					3		
Alectryon diversifolius	P					3		
Pimelea neoanglica	P						2	
Canopy stratum (%)								70
Mid stratum (%)								30
Ground stratum (%)								70
Rock cover (%)								
Bare ground cover (%)								20
Litter cover (%)								10

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Megathyrsus maximus v pubiglumis

Weed Cover (%): <5

Disturbance (% of site affected): <1

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: brown

Soil Texture: silty loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
……

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Ecotonal Roadside

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T10 KP: Codie Assessor: Ann Moran Date : 19/07/2008

Location: Mary's Road Photo #: GPS

GPS Projection: UTM Datum: GDA94; zone: 56 Easting: 241486 Northing: 7006504
Waypoint #: ..
Width of RE: >300
Width of total remnant: <300
Total RE Area: >50 ha
Total remnant Area: >50 ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.7		Not of Concern
Survey result	11.7.5		Not of Concern

Canopy stratum form: Shrub Canopy Crown Cover: 70%
Canopy Median Height: 2m Structural Code: Shrubland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Philotheca sporadica	A							
Mirbelia pungens	P							
Eucalyptus exserta	P							
Caladenia caerulea	P							
Thyridolepis mitchelliana	P							
Cryptandra armata	U							
Boronia bipinnata v bipinnata	U							
Eucalyptus exserta	U							
Cheilanthes distans	R							
Micromyrtus hexamera	R							
Canopy stratum (%)								10
Mid stratum (%)								
Ground stratum (%)								80
Rock cover (%)								
Bare ground cover (%)								10
Litter cover (%)								10

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes *Philotheca sporadica*
Collected *Philotheca sporadica* with photos
Additional notes on pest plants
Nil
Weed Cover (%):

Disturbance (% of site affected):

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: brown

Soil Texture: Stony

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
Roads and pipeline are fragmenting the population

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Abundant along many roadside in this area

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T11 KP: …… Assessor: Ann Moran Date : 21/07/2008

Location: Kenya Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 246727 Northing: 7016804 Waypoint #: ..

Width of RE: 150-300m

Width of total remnant: 75-150m

Total RE Area: 1-5 ha

Total remnant Area: 1-5 ha

	RE code	EPBC status	VMA status
DNRW RE map	Non-remnant		
Survey result	11.3.1	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 70%

Canopy Median Height: 15m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Acacia harpophylla	A	20	15	10	6	4	2	
Brunoniella australis	O							1
Tetragonia tetragonioides	O							1
Casuarina cristata	O		15	10				
Eremophila mitchellii	O				6	3	2	
Digitaria divaricatissima	O							1
Citrus glauca	O					3		
Einadia hastata	U							1
Enchylaena tomentosa v glabra	U							1
Amyema quandang v quandang	U							
Paspalidium caespitosum	U							1
Solanum nemophilum	U						1	
Eucalyptus coolabah	P			10				
Eucalyptus populnea	P			10				
Panicum subxerophilum	P							1
Geijera parviflora	P						2	
Canopy stratum (%)								70
Mid stratum (%)								30
Ground stratum (%)								50
Rock cover (%)								
Bare ground cover (%)								20
Litter cover (%)								30

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Nil

Weed Cover (%):

Disturbance (% of site affected):

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: brown

Soil Texture: clay loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
……

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Remnant which has linkages to the nearby creek

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T12 KP: Ruby Assessor: Ann Moran Date : 20/07/2008

Location: Beelbee Road Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 283522 Northing: 6991721 Waypoint #: ..

Width of RE: >300

Width of total remnant: >300

Total RE Area: >50ha

Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.6/11.5.4		Not of Concern/Not of Concern
Survey result	11.7.6/11.5.6		Not of Concern/Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 80%

Canopy Median Height: 25 m Structural Code: Tall open forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Corymbia citriodora ssp variegata	A	30	25	20				
Calotis dentex	O							1
Allocasuarina luehmannii	O				15	5		
Gahnia aspera	O							1
Lomandra longifolia	O							1
Sida subspicata	O						2	
Acacia bancroftiorum	O						2	
Acacia decora	O						2	
Eucalyptus crebra	O				15			
Ancistrachne uncinulata	O							1
Enneapogon nigricans	O							1
Panicum effusum v effusum	O							1
Solanum nemophilum	O						1	
Carissa ovata	P						2	
Acacia deanei ssp deanei	P						2	
Geijera parviflora	P						2	
Cheilanthes sieberi	U							1
Daviesia ulicifolia	U						2	
Acacia leiocalyx ssp leiocalyx	U					4		
Pimelea neoanglica	U						1	
Eucalyptus populnea	E			15				
Triodia longiceps	E							1
Canopy stratum (%)								80
Mid stratum (%)								10
Ground stratum (%)								70
Rock cover (%)								
Bare ground cover (%)								10
Litter cover (%)								20

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Verbena tenuisecta
Weed Cover (%): <5

Disturbance (% of site affected): <1

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow

Soil Texture: sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
Cliff crest susceptible to erosion

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops Forestry Management

Other notes: Heavily logged in the past

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T13 KP: Leichhardt Assessor: Ann Moran Date : 21/07/2008

Location: Glenolive Road Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56 Easting: 217177 Northing: 7027084

Width of RE: 35-75
Width of total remnant: 35-75
Total RE Area: <1 ha
Total remnant Area: <1 ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.2		Of Concern
Survey result	11.3.2		Of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 60%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus populnea	A		20	15				
Eremophila mitchellii	C				5	3	2	
Callitris glaucophylla	O				5	3		
Acacia leiocalyx ssp leiocalyx	O					4		
Corymbia polycarpa	O			10	5			
Aristida leptopoda	O							<1
Dodonaea viscosa ssp spatulata	O						2	
Myoporum acuminatum	U					3		
Corymbia tessellaris	U			15				
Enteropogon acicularis	U							<1
Eucalyptus coolabah	P			10				
Ventilago viminalis	P				5			
Cymbidium canaliculatum	R							
Owenia acidula	R				5			
Canopy stratum (%)								40
Mid stratum (%)								50
Ground stratum (%)								50
Rock cover (%)								
Bare ground cover (%)								40
Litter cover (%)								10

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
**Cenchrus ciliaris*
**Urochloa mosambicensis*

Weed Cover (%): <5

Disturbance (% of site affected): 1-5%

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow

Soil Texture: sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
Old road through the centre of remnant

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Roadside vegetation

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T14 KP: …… Assessor: Ann Moran Date : 21/07/2008

Location: Winbri Camp Roadside Photo #: GPS

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 232882 Northing: 7023606 Waypoint #: ..

Width of RE: <35

Width of total remnant: <35

Total RE Area: <1 ha

Total remnant Area: <1 ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.14		Not of Concern
Survey result	11.3.14		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%

Canopy Median Height: 20m Structural Code: Shrubby Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus tereticornis	C		20		10			
Callitris glaucophylla	C	25	20	15	8			
Lomandra longifolia	C							<1
Allocasuarina luehmannii	O				8	5		
Cheilanthes distans	O							<1
Enchylaena tomentosa v glabra	O							<1
Pultenaea microphylla	O							<1
Acacia leiocalyx ssp leiocalyx	O					4		
Dianella revoluta v revoluta	O							<1
Aristida caput-medusae	O							<1
Arundinella nepalensis	O							<1
Cymbopogon refractus	O							<1
Corymbia tessellaris	P			15				
Eucalyptus chloroclada	P				10			
Acacia conferta	U						2	
Eucalyptus populnea	U				10			
Chrysocephalum apiculatum	U							<1
Canopy stratum (%)								70
Mid stratum (%)								50
Ground stratum (%)								60
Rock cover (%)								
Bare ground cover (%)								10
Litter cover (%)								30

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Salsola kali
Weed Cover (%): <1 Edge only

Disturbance (% of site affected):

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: yellow

Soil Texture: sandy

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..
Sandy soil deeply drained

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops ……..

Other notes: Roadside

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T15 KUMBARILLA RD Assessor: Ann Moran Date : 6/08/08

Location: Baemar SF GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 290452 Northing: 6986598
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.4a/11.5.4		Not of Concern/Not of Concern
Survey result	11.5.4a/11.5.4		Not of Concern/Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 15m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Allocasuarina inophloia	C			15	10			
Callitris glaucophylla	C				10	5	2	
Acacia conferta	C						2	
Pomax umbellata	C							<1
Cheilanthes sieberi	O							<1
Cheilanthes tenuifolia	O							<1
Podolepis longipedata	O							<1
Gahnia aspera	O							<1
Petalostigma pubescens	O					5		
Acacia crassa ssp crassa	O				10	8		
Acacia leiocalyx ssp leiocalyx	O					5	3	
Acacia triptera	O						3	
Corymbia trachyphloia	O			15				
Lysicarpus angustifolius	O				10	8		
Aristida caput-medusae	O							<1
Eragrostis elongata	O							<1
Eragrostis sororia	O							<1
Alphitonia excelsa	O				10	8		
Geijera parviflora	O						2	
Eucalyptus fibrosa ssp fibrosa	U			15				
Leptospermum polygalifolium	U						3	
Aristida leptopoda	U							<1
Enteropogon acicularis	U							<1
Panicum effusum v effusum	U							<1
Chrysocephalum apiculatum	P							<1
Lomandra longifolia	P							<1
Canopy stratum (%)								30%
Mid stratum (%)								80%
Ground stratum (%)								60%
Bare ground cover (%)								20%
Litter cover (%)								20%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Verbena tenuisecta Mayne's pest
Weed Cover (%): <1 Edge only

Disturbance (% of site affected): 0

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: Brown

Soil Texture: sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:……Forestry - Past logging
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Timber industry

Other notes: Lots of dead timber with log as habitat for fauna
Many different Acacia species

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T16 KP: …… Assessor: Ann Moran Date : 6/08/08

Location: Baemar SF GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 232882 Northing: 7023606
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.6/11.5.4		Not of Concern/Not of Concern
Survey result	11.7.6/11.5.4		Not of Concern/Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 80%
Canopy Median Height: 20m Structural Code: Shrubby Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Corymbia citriodora ssp variegata	A	30	25	20				
Brunoniella australis	O							<1
Acacia bancroftiorum	O						2	
Acacia burrowii	O					5		
Acacia leiocalyx ssp leiocalyx	O					5		
Calyptochloa gracillima	O							<1
Dodonaea triangularis	O						1	
Podolepis longipedata	U							<1
Gahnia aspera	U							<1
Laxmannia gracilis	U							<1
Lomandra longifolia	U							<1
Acacia conferta	U						2	
Acacia muelleriana	U						2	
Aristida caput-medusae	U							<1
Aristida leptopoda	U							<1
Pomax umbellata	U							<1
Dianella revoluta v revoluta	U							<1
Callitris glaucophylla	P				8			
Scleria sphacelata	P							<1
Hibbertia stricta	P							<1
Eucalyptus decorticans	P			10				
Themeda triandra	P							<1
Canopy stratum (%)								80%
Mid stratum (%)								
Ground stratum (%)								20%
Rock cover (%)								
Bare ground cover (%)								
Litter cover (%)								80%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Salsola kali
Weed Cover (%): <1 Edge only

Disturbance (% of site affected):

Health: Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: Orange brown

Soil Texture: stony

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:……
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Timber industry

Other notes: Logged in the past - Many different Acacia species

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T17 Assessor: Ann Moran Date : 6/08/08

Location: T17 Baemar SF GPS Projection: UTM Datum: GDA94; Zone: 56
Easting: 281889 Northing: 6990039
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.9.5	Endangered	Endangered
Survey result	11.9.5	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 80%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Casuarina cristata	C		20	15	10			
Acacia harpophylla	C		20	15	10			
Geijera parviflora	C						2	
Tetragonia tetragonioides	O							<1
Einadia nutans ssp nutans	O							<1
Enteropogon acicularis	O							<1
Portulaca oleracea	P							<1
Alectryon diversifolius	P						3	
Enchylaena tomentosa v glabra	U							<1
Callitris glaucophylla	E			10		5		
Eucalyptus piligaensis	E			10				
Brachychiton populneus ssp trilobus	E					5		
Wikstroemia indica	E						1	
Canopy stratum (%)								80%
Mid stratum (%)								20%
Ground stratum (%)								70%
Bare ground cover (%)								10%
Litter cover (%)								20%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Salsola kali

Weed Cover (%): <1 Edge only

Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: Brown

Soil Texture: silty clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:.....Forestry - Past logging
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Timber industry

Other notes: Edges with *Eucalyptus piligaensis*
Roadside ectone with jumpup on one side and Bigalow Belah on the otherside

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T18 Assessor: Ann Moran Date : 6/08/08

Location: T18 Baemar SF GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 286183 Northing: 6988396
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.4/11.5.1		Not of Concern/Not of Concern
Survey result	11.5.4/11.5.1		Not of Concern/Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Allocasuarina luehmannii	A			10	8			
Callitris glaucophylla	O		20	10	8			
Gahnia aspera	O							<1
Lysiana exocarpi ssp tenuis	O							
Acacia leiocalyx ssp leiocalyx	O						2	
Eucalyptus crebra	O	30	20	10				
Aristida leptopoda	O							<1
Eremophila debilis	U							<1
Digitaria divaricatissima	U							<1
Goodenia paniculata	P							<1
Angophora leiocarpa	P		20					
Aristida caput-medusae	P							<1
Canopy stratum (%)								30%
Mid stratum (%)								70%
Ground stratum (%)								30%
Rock Cover (%)								
Bare ground cover (%)								50%
Litter cover (%)								20%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia tomentosa Tree Pear
Weed Cover (%): <1 Edge only

Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: Brown

Soil Texture: silty clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:..……Forestry - Past logging
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Timber industry

Other notes: Has been burnt in spots has 2 man made dams

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T19 Assessor: Ann Moran Date : 7/08/08

Location: T19 NINE MILE CK GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 205796 Northing: 7062180
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.1/11.7.7		Not of Concern/Not of Concern
Survey result	11.5.1/11.7.7		Not of Concern/Not of Concern

Canopy stratum form: Tree Canopy Crown Cover: 80%
Canopy Median Height: 25m Structural Code: Tall open forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Corymbia citriodora ssp variegata	A	30	25	20				
Callitris glaucophylla	O				8			
Acacia conferta	O							
Acacia semilunata	O						3	
Gahnia aspera	U							<1
Lomandra longifolia	U							<1
Angophora leiocarpa	U			15				
Calyptochloa gracillima	U							<1
Boronia bipinnata v bipinnata	U						1	
Eucalyptus chloroclada	P				8			
Eucalyptus fibrosa ssp nubilis	P			20				
Eucalyptus piligaensis	P				15			
Aristida leptopoda	P							<1
Canopy stratum (%)								80%
Mid stratum (%)								20%
Ground stratum (%)								10%
Rock Cover (%)								20%
Bare ground cover (%)								20%
Litter cover (%)								50%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No
Additional notes on pest plants
No weeds
Weed Cover (%): Nil
Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat;

Soils: Surface observation **Reliability:** Low

Soil Colour: Grayish

Soil Texture: stony

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:..……Forestry - Past logging
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Timber industry

Other notes: Stony - lots of dead timber –
Little in ground layer to shady

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T20 Assessor: Ann Moran Date : 7/08/08

Location: T20 Gurulmundi GPS Projection: UTM Datum: GDA94; Zone: 55

Easting: 798392 Northing: 7074376
Width of RE: >330m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.5		Not of Concern
Survey result	11.7.5		Not of Concern

Canopy stratum form: Shrubs Canopy Crown Cover: 80%
Canopy Median Height: 3m Structural Code: Shrubland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Acacia curranii	D					3		
Commersonia pedleyi	C						1	
Leucopogon pleiospermus	C					2		
Chrysocephalum apiculatum	O							1
Dampiera adpressa	O							1
Babingtonia densifolia	O						2	
Kunzea opposita	O						2	
Melaleuca uncinata	O					3		
Triodia species	O							1
Hakea purpurea	O						2	
Xanthorrhoea johnsonii	O							1
Jacksonia scoparia	U						2	
Micromyrtus sessilis	U					3		
Boronia glabra	U						2	
Pimelea neoanglica	U							1
Mid stratum (%)								80%
Ground stratum (%)								80%
Rock Cover (%)								
Bare ground cover (%)								10%
Litter cover (%)								10%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes
Acacia curranii Very Large Patch
Additional notes on pest plants
No weeds
Weed Cover (%): Nil
Disturbance (% of site affected): 0

Health: Excellant

Slope: Ridge

Soils: Surface observation **Reliability:** Low

Soil Colour: orange

Soil Texture: stony

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance:.....Forestry - Past logging
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Forestry/ Very restricted to none at present

Other notes: Stony – Many young plants of ***Acacia curranii*** regenerating after fire

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T21 Harry's Assessor: Ann Moran Date : 11/08/08

Location: T21 Disturbed Roadside GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 302616 Northing: 6974185
Width of RE: <35m
Width of total remnant: <35m
Total RE Area: <1ha
Total remnant Area: <1ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.20/11.5.1		Not of Concern/Not of Concern
Survey result	11.5.1		Not of Concern

Canopy stratum form: Trees Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Allocasuarina luehmannii	C			15				
Eucalyptus crebra	C		20					
Callitris glaucophylla	O		20	15	8			
Dianella revoluta v revoluta	O							1
Dodonaea macrossanii	**O**						1	
Angophora leiocarpa	P	25						
Digitaria divaricatissima	P							1
Eragrostis sororia	P							1
Panicum effusum v effusum	P							1
Chrysocephalum apiculatum	U							
Acacia chinchillensis	**U**							
Cyperus concinnus	U							1
Mid stratum (%) Degraded								
Ground stratum (%) Degraded								
Rock Cover (%) Degraded								
Bare ground cover (%) Degraded								
Litter cover (%) Degraded								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes
Dodonaea macrossanii Rare
Acacia chinchillensis Rare

Additional notes on pest plants
Mother for Millions
Weed Cover (%): <1%
Disturbance (% of site affected): 0

Health: Degraded

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: grayish yellow

Soil Texture: sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance: Roadside
cultural ……
commercial ……..
recreational ……..

observed or Horticultural Crops …Entrance to Property

Other notes: Dead trees with some fallen logs - old roads and mounded soils not remnant
Rare plants could have been spread by road graders

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T22 Harry's Assessor: Ann Moran Date : 7/08/08

Location: Gurulmundi Shrubland GPS Projection: UTM Datum: GDA94; Zone: 55

Easting: 793378 Northing: 7074195
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.5		Not of Concern
Survey result	11.7.5		Not of Concern

Canopy stratum form: Shrubs Canopy Crown Cover: 80%
Canopy Median Height: 2m Structural Code: Shrubland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Calytrix gurulmundensis	C						2	
Jacksonia rhadinoclona	O						2	
Acacia decora	O						2	
Acacia juncifolia	O						2	
Lysicarpus angustifolius	O					5		
Grevillea longistyla	O						2	
Hakea purpurea	O						2	
Xanthorrhoea johnsonii	O							1
Dampiera adpressa	U							1
Eucalyptus curtisii	U					4		
Acacia shirleyi	E				8			
Mid stratum (%)								80%
Ground stratum (%)								70%
Rock Cover (%)								20%
Bare ground cover (%)								
Litter cover (%)								10%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes
Calytrix gurulmundensis
Additional notes on pest plants None
Weed Cover (%): 0
Disturbance (% of site affected): 0

Health: Excellent

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Orange

Soil Texture: Stony pebbles

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance: All Roadside vegetation
cultural ……
commercial ……..
recreational ……..

observed Horticultural Crops: Two sections use for farming practices to the far North and the Southern ends of the tenements;

Other notes: EVR Species found throughout Gurulmundi State Forest
on and around all Heathlands 11.7.5

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T23 Assessor: Ann Moran Date : 11/08/08

Location: T23 Willie Creek GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 303443 Northing: 6967979
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.4		Not of Concern
Survey result	11.5.1		Not of Concern

Canopy stratum form: Trees Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus crebra	C		25	20				
Brachyscome sp	O							<1
Allocasuarina luehmannii	O			20	15			
Callitris glaucophylla	O				10	8		
Fimbristylis bisumbellata	O							<1
Melichrus urceolatus	O						1	
Daviesia genistifolia	O						2	
Lomandra leucocephala v leucocephala	O							<1
Acacia chinchillensis	O						1	
Babingtonia jucunda	O						2	
Melaleuca decora	O					5		
Pomax umbellata	O							1
Chrysocephalum apiculatum	U							1
Leucopogon biflorus	U							1
Leucopogon muticus	U							1
Leucopogon pleiospermus	U						2	
Acacia muelleriana	P						2	
Acacia spectabilis	P						2	
Canopy stratum (%)								30%
Mid stratum (%)								70%
Ground stratum (%)								50%
Rock Cover (%)								
Bare ground cover (%)								10%
Litter cover (%)								40%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes
Acacia chinchillensis
Additional notes on pest plants None
Weed Cover (%): 0
Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Yellow

Soil Texture: Sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):……..

Special conservation significance: All Roadside vegetation
cultural ……
commercial ……..
recreational ……..

observed Horticultural Crops: Forestry Area near Wilkies Creek which was large waterway Camping area on the other side

Other notes: Rare Acacia at obverse site appears to be on one side of the road/track maybe due to light availability or burnt only on one side of track

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T24 Assessor: Ann Moran Date : 12/08/08

Location: T24 Rockwood SF GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 228967 Northing: 7018996
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.4/11.7.7		Not of Concern/Not of Concern
Survey result	11.7.4/11.7.7		Not of Concern/Not of Concern

Canopy stratum form: Trees Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Carissa ovata	A							1
Acacia shirleyi	A			10	5			
Eucalyptus crebra	C	25	20	15				
Acacia conferta	O						2	
Acacia wardellii	O					3		
Notelaea microcarpa v microcarpa	O					3		
Alectryon diversifolius	O						2	
Dodonaea macrossanii	O						1	
Brachyscome sp	U							1
Calotis dentex	U							1
Petalostigma pubescens	U					5		
Paspalidium caespitosum	U							1
Calotis cuneata v cuneata	U							1
Calotis lappulacea	U							1
Digitaria papposa	U							1
Chrysocephalum apiculatum	P							1
Olearia ramosissima	P						2	
Aristida caput-medusae	P							1
Canopy stratum (%)								30%
Mid stratum (%)								70%
Ground stratum (%)								90%
Rock Cover (%)								
Bare ground cover (%)								
Litter cover (%)								10%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes
Acacia wardellii
Dodonaea macrossanii

Additional notes on pest plants None
Weed Cover (%): 0
Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Yellow

Soil Texture: Sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):
Many small birds Heard; Logs lying throughout, Mistletoes on *Acacia shirleyii*

Special conservation significance: All Roadside vegetation
cultural ……
commercial ……..
recreational ……..

observed Horticultural Crops: Forestry Area

Other notes: Rare Acacia at obverse site spreading along disturbed gas pipeline and roadside

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T25 Assessor: Ann Moran Date : 14/08/08

Location: T25 Old Moonie Road GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 275393 Northing: 6974105
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.2/11.3.25		Of Concern/Not of Concern
Survey result	11.3.1	Endangered	Endangered

Canopy stratum form: Trees Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Casuarina cristata	D		20	15				
Geijera parviflora	C						2	
Nyssanthes erecta	O							1
Enteropogon acicularis	O							1
Capparis loranthifolia v loranthifolia	P						2	
Einadia nutans ssp nutans	P							1
Cyperus gracilis	P							1
Eucalyptus piligaensis	P			15				
Brunoniella australis	U							1
Enchylaena tomentosa v glabra	U							1
Citrus glauca	U						2	
Eucalyptus populnea	E			15				
Canopy stratum (%)								70%
Mid stratum (%)								30%
Ground stratum (%)								10%
Rock Cover (%)								
Bare ground cover (%)								
Litter cover (%)								90%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants None
Weed Cover (%): 0
Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Brown

Soil Texture: Sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):
Many small birds Heard; Logs lying throughout, Mistletoes on *Acacia shirleyii*

Special conservation significance: All Roadside vegetation
cultural ……
commercial ……..
recreational ……..

observed Horticultural Crops: Forestry Area

Other notes: Good Condition Habitat for fauna
Both sides the road agreeing with maaping of RE 11.3.2
Except for this Patch of Belah RE 11.3.1

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T26 Assessor: Ann Moran Date : 14/08/08

Location: T26 MA GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 272987 Northing: 6960413
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.1a/11.3.17		Not of Concern/ Of Concern
Survey result	11.3.1	Endangered	Endangered

Canopy stratum form: Trees Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Acacia harpophylla	A		20	15	8			
Geijera parviflora	A					3	2	
Brunoniella australis	C							1
Casuarina cristata	C		20		8	5		
Enteropogon acicularis	C							1
Einadia nutans ssp nutans	O							1
Nyssanthes erecta	P							1
Sarcostemma viminale ssp australe	P						2	
Santalum lanceolatum	P					3		
Brachyscome multifida	U							1
Eucalyptus populnea	E		20	15				
Canopy stratum (%)								70%
Mid stratum (%)								30%
Ground stratum (%)								80%
Rock Cover (%)								
Bare ground cover (%)								10%
Litter cover (%)								10%

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants
Opuntia tomentosa Tree pear
Weed Cover (%): 0
Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Brown

Soil Texture: Sandy loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation):

Special conservation significance: All Roadside vegetation
cultural ……
commercial ……..
recreational ……..

observed Horticultural Crops: Forestry Area

Other notes: Good Condition Habitat for fauna
Patch of Bigalow and Belah RE 11.3.1

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T27 KP: Assessor: Ann Moran Date : 26/09/2008

Location: QGC – KENYA LAND Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 247810…… Northing: 7106774……Waypoint #: 26.57442……..
Width of RE: <35m
Width of total remnant: <35m
Total RE Area: Does not extend beyond site; <1ha
Total remnant Area: Does not extend beyond site; <1ha

	RE code	EPBC status	VMA status
DNRW RE map	regrowth		
Survey result	regrowth		

Canopy stratum form: ; Canopy Crown Cover:
Canopy Median Height:. Structural Code:

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Acacia harpophylla	C				4	3	2	
**Senicea sp*	P							0
Santalum lanceolatum	P							<1
Opuntia tomentosa	P							<1
Enchylaena tomentosa v glabra	O							<1
Tetragonia tetragonioides (NZ spinach)	O							<1
Solanum nemophilum	O						2	
Calotis lappulacea	P							<1
Enteropogon acicularis	O							<1
**Plantago lanceolata*	O							<1
**Verbena macrostachya*	P							<1
**Verbena gaudichaudiil*	P							<1
Atriplex muelleri	O						1	
Sonchus oleracea	O							<1
Enchylaena tomentosa	O							<1
Acacia excelsa ssp excelsa	P						2	
Carissa ovata	P					3		
**Panicum maximum*	E						<1	
Canopy stratum (%)								
Mid stratum (%)								
Ground stratum (%)								
Rock cover (%)								
Bare ground cover (%)								
Litter cover (%)								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities:

Additional notes on pest plants

Weed Cover (%): <5

Disturbance (% of site affected): 1-5

Health: Average

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Yellow

Soil Texture: Stony clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils……
……
…

Special conservation significance:
cultural ……
commercial ……
recreational ……..
observed or Horticultural Crops

Other notes: Predominantly grazing areas

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T28 KP: Assessor: Ann Moran Date : 28/08/2008

Location: NINE MILE CREEK Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 252013……. Northing: 7016652……Waypoint #: ……..
Width of RE: <35m
Width of total remnant: <35m
Total RE Area: Does not extend beyond site; <1ha
Total remnant Area: Does not extend beyond site; <1ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.25		Not of Concern
Survey result	11.3.25		Not of Concern

Canopy stratum form: Tree ; Canopy Crown Cover: 50%
Canopy Median Height:. 20m Structural Code: Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus coolabah	C		20	15				
Eucalyptus populnea	O			15				
Eucalyptus tereticornis	C		20	15				
Allocasuarina deichorami	P					8		
Acacia leiocalyx	P						3	
Opuntia tomentosa	P							
Senna aciphylla	P						2	
Megathyrsus maximus v pubiglumis	P							1
Eremophila mitchellii	O						2	1
Canopy stratum (%) 50%								
Mid stratum (%) 40%								
Ground stratum (%) 60%								
Rock cover (%)								
Bare ground cover (%) 20%								
Litter cover (%) 20%								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants
Optuntia tomentosa

Weed Cover (%): <5

Disturbance (% of site affected): 0

Health: Average

Slope: ; Open Depression

Soils: Surface observation **Reliability:** Low

Soil Colour: Yellow

Soil Texture: Sandy Loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils……
……
……

Special conservation significance:
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops

Other notes:

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T29 KP: 96 Assessor: Ann Moran Date : 28/08/2008

Location: WIEAMBILLA CREEK Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 252013……. Northing: 240040…….Waypoint #: 7022846……..
Width of RE: <35m
Width of total remnant: <35m
Total RE Area: Does not extend beyond site; <1ha
Total remnant Area: Does not extend beyond site; <1ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.2		Of Concern
Survey result	11.3.2		Of Concern

Canopy stratum form: Tree ; Canopy Crown Cover: 40%
Canopy Median Height:. 25m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus populnea	C	30	25					
Eucalyptus coolabah	C			20	15			
Dianella revoluta v revoluta	O							1
Acacia salicina	E						2	
Eremophila mitchellii	E					3		
Callitris glaucophylla	O					5		
Corymbia tessellaris	O				15	8		
Acacia leiocalyx ssp leiocalyx							2	
Lomandra longifolia	O							1
Dianella brevipedunculata	C							1
Corymbia tessellaris	C				15	8		
Cymbopogon refractus	P							1
Heteropogon contortus	O							1
Arundinella nepalensis	P							1
Allega australa	P							1
Eragrostis sororia	P							
Eucalyptus tereticornis	O				15	8		
Sida rhombifolia	P							1
Acacia pendula	E				15			
Sarcostemma viminale ssp australe	P							1
Canopy stratum (%) 50%								
Mid stratum (%) 40%								
Ground stratum (%) 60%								
Rock cover (%)								
Bare ground cover (%) 20%								
Litter cover (%) 20%								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Yes- *Acacia wardelli*

Additional notes on pest plants

Weed Cover (%): <5

Disturbance (% of site affected): 0

Health: Very Good

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Orange

Soil Texture: Sandy Loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils……
……
……

Special conservation significance:
health condition southern side good, north side cleared over fence
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops

Other notes:

Tertiary Site Vegetation Assessment Data Sheet Job Number: Interconnect……

Site Number: T30 KP: Assessor: Ann Moran Date : 29/08/2008

Location: MOONIE HWY / CLAYHOLE CREEK Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 252013……. Northing: 295594……Waypoint #: 6975623……..
Width of RE: >300
Width of total remnant: >300
Total RE Area: Does not extend beyond site; >50ha
Total remnant Area: Does not extend beyond site; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.5.1a		Not of Concern
Survey result	11.5.1a		Not of Concern

Canopy stratum form: Tree ; Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Allocasuarina luehmannii	D					5		
Melaleuca decora	O				10	5		
Eucalyptus populnea	A	25	20	15				
Aristida caput-medusae	P							1
Enteropogon acicularis	P							1
Maireana microphylla	P							1
Senna aciphylla	O						2	
Eremophila mitchellii	O					5	2	
Wahlenbergia stricta	P							1
Bothriochloa bladhii ssp *glabra*	P							1
Sporboblus creba	P							1
Acacia decora	P						2	
Geijera parvillora	P							1
Acacia spectabilis	P						2	
Canopy stratum (%) 30%								
Mid stratum (%) 90%								
Ground stratum (%) 50%								
Rock cover (%)								
Bare ground cover (%) 20%								
Litter cover (%) 10%								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Nearby *Acacia chinchillensis (herbrex* site)

Additional notes on pest plants
Bryophyllum spp (mother of millions)
Eragrostis cilianensis is abundant
Verbena Tenuisecta

Weed Cover (%): <5

Disturbance (% of site affected): <1

Health: Average

Slope: Flat Depression

Soils: Surface observation **Reliability:** Low

Soil Colour: Yellow

Soil Texture: Sandy Loam

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils……
……
……

Special conservation significance:
cultural ……
commercial ……
recreational ……
observed or Horticultural Crops

Other notes:

Drainage Line containing water nearby
Erosion observed- Soils stockpiled

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T31 KP: Assessor: Ann Moran Date : 30/09/2008

Location: CONDAMINE POWER STATION Photo #: ……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 228351…… Northing: 7046395……Waypoint #: 26.40648……..
Width of RE: >300m
Width of total remnant: >300m
Total RE Area: Does not extend beyond site; >50ha
Total remnant Area: Does not extend beyond site; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.7/11.7.5		Not of Concern/Not of Concern
Survey result	11.7.5		Not of Concern

Canopy stratum form: Shrubland Canopy Crown Cover: 40%
Canopy Median Height: 2m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Brachychiton populneus	P	25	20	15				
Angophora leiocarpa	O				8			
Callitris glaucophylla	C							
Thyridolepis mitchelliana	C							<1
Acacia ixiophylla	O						2	
Melichrus urceolatus	O							<1
Gahnia aspera	O							<1
Alphitonia excelsa	P						2	
Acacia crassa ssp *crassa*	P					3		
Aristida leptopoda	P							<1
Fimbristylis dichotoma	P							<1
Micromyrtus sessilis	C					3		
Badingtonia jucunda	P						4	
Solanum nemophilum	O							<1
Aristida caput-medusae	C							<1
Acacia triptera	O						2	
Cheilanthes distans	P							<1
Oxalis corniculata	P							<1
Cyanthillium cinereum	P							<1
Aristida holathera	P							<1
Goodenia delicata	P							<1
Bulbostylis sp.	P							<1
Laxmannia gracilis	P							<1
Wahlenbergia communis	C							
Canopy stratum (%)								
Mid stratum (%)								
Ground stratum (%)								
Rock cover (%)								
Bare ground cover (%)								
Litter cover (%)								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: Possibility for rare and threatened plants to be found in the area.

Additional notes on pest plants: *Sida spinosa* was found to be present.

Weed Cover (%): <5

Disturbance (% of site affected): 0

Health: Average

Slope: Flat

Soils: Surface observation **Reliability:** Low

Soil Colour: Orange

Soil Texture: Silty Clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils
……
……

Special conservation significance:
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops

Other notes:

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T32 KP: 80 Assessor: Jill / Lisa Date : 29/08/2008

Location: NANGRAM Photo #: 32..……

GPS Projection: UTM Datum: GDA94; Zone: 56

Easting: 230047……. Northing: 7024428..……Waypoint #: 26.52547……..
Width of RE: >300m
Width of total remnant: >300
Total RE Area: Does not extend beyond site; <1ha
Total remnant Area: Does not extend beyond site; <1ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.5		Not of Concern
Survey result	11.7.5		Not of Concern

Canopy stratum form: 3 m ; Canopy Crown Cover: 90%
Canopy Median Height:. 3 m Structural Code: Shrubland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. Dom.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	G
Eucalyptus exserta	O			4				
Acacia shirleyi	E		6					
Calytrix longifolia	C						1	
Dendrophthoe vitellina	D					2		0.5
Corymbia trachyphloia	E	12						
Brachychiton populneus	E		6					
Alstonia constricta	C						1	
Dianella revoluta v revoluta	C							0.5
Allocasuarina inophloia	O			4				
Laxmannia gracilis	P							0.5
Acacia decora	P					2		
Boronia glabra	P						1	
Carissa ovata	P					2		
Scleria sphacelata	P							0.5
Eragrostis sororia	P							0.5
Thyridolepis mitchelliana	P							0.5
Ancistrachne unciulata	P							0.5
Homalocalyx polyandrus	P							0.5
Canopy stratum (%) 50%								
Mid stratum (%) 40%								
Ground stratum (%) 60%								
Rock cover (%)								
Bare ground cover (%) 20%								
Litter cover (%) 20%								

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum

Scheduled flora possibilities: No

Additional notes on pest plants
Optuntia tomentosa

Weed Cover (%): < 5

Disturbance (% of site affected): 0

Health: Average

Slope: Hillock

Soils: Surface observation **Reliability:** Low

Soil Colour: Orange

Soil Texture: Silty clay

Legend	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3
E	Edge not inside community	1 - 10
*	Weed or Garden escapee	

Particular sensitivities to proposed impacts (incl. fragmentation): Erodible soils……
……

Special conservation significance:
cultural ……
commercial ……..
recreational ……..
observed or Horticultural Crops Wheat / grazing

Other notes:

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T33 Assessor: Ann Date : 19/01/2009

Location: Wambo Ck along Chinchilla Tarra Road Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 250377 Northing: 7026445

Width of RE: <35m wide ; 35-75m ; 75-150m ; 150-300m ; >300 ; not linear
Width of total remnant: <35m wide ; 35-75m ; 75-150m ; 150-300m ; >300 ; not linear
Total RE Area: Does not extend beyond site; <1ha ; 1-5ha; 5-20ha ; 20-50ha ; >50ha
Total remnant Area: Does not extend beyond site; <1ha ; 1-5ha; 5-20ha ; 20-50ha ; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.4.12		Endangered
Survey result	11.4.12		Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 20m. Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	T1	T2	T3	S1	S2	Ground Layer <1m	No.
Eucalyptus populnea	C		20	15	10			*Aristida caput-medusae*	P
Callitris glaucophylla	C				10	5	3	*Austrostipa scabra*	P
Acacia excelsa ssp excelsa	O					5	3	*Cymbopogon refractus*	P
Geijera parviflora	O						2	*Dactyloctenium radulans*	P
Eremophila mitchellii	P					5		*Enteropogon acicularis*	P
Eucalyptus chloroclada	P				8			*Heteropogon contortus*	P
Psydrax attenuata forma	P					5		*Paspalidium caespitosum*	O
								Aristida caput-medusae	P
								Austrostipa scabra	P
								Cymbopogon refractus	P
								Salsola kali	P
								Sclerolaena calcarata	P
								Lomandra leucocephala	P
								Einadia hastata	P
								Maireana microphylla	P
Canopy stratum (%) 30%									
Mid stratum (%) 20%									
Ground stratum (%) 40%									
Rock cover (%)									
Bare ground cover 40%									
Litter cover 20%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia aurantiaca
Opuntia tomentosa
Bryophyllum delagoense Mother of Millions
Cenchrus ciliaris Buffel Grass
Chloris gayana Rhodes Grass

Weed Cover (%): 5-25 ;

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Crest; Ridge; Hillock; Simple slope; Upper slope; Mid slope; Lower slope; Flat; Open depression; Closed depression

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: silty clay loam;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3



Particular sensitivities to proposed impacts (incl. fragmentation):
Roadside edge effects
Special conservation significance:……
Other notes such as Health, Condition:
poor……
Landuse Grazing
observed or Horticultural Crops ……..
Over fence or opposite sides road Similar vegetation over the road

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T34 Assessor: Ann Date : 19/01/2009

Location: Chinchilla Tarra Road Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 250900 Northing: 7028656

	RE code	EPBC status	VMA status
DNRW RE map	11.4.3	Endangered	Endangered
Survey result	11.4.3	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m. Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Casuarina cristata	A		20	15	10			*Ancistrachne uncinulata*	P
Geijera parviflora	O					3		*Enteropogon acicularis*	U
Carissa ovata	O						2	*Paspalidium caespitosum*	O
Capparis mitchellii	P						2	*Brunoniella australis*	P
Citrus glauca	P					3		*Einadia hastata*	P
Capparis lasiantha	P						2	*Enchylaena tomentosa*	P
Solanum nemophilum	P						1		
Eremophila mitchellii	U					3			
Canopy stratum (%) 70%									
Mid stratum (%) 30%									
Ground stratum (%) 10%									
Rock cover (%)									
Bare ground cover 80%									
Litter cover 10%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia aurantiaca
Opuntia tomentosa

Weed Cover (%): <5;

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: sandy clay loam;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3

Particular sensitivities to proposed impacts (incl. fragmentation):
Roadside edge effects
Special conservation significance:……
Other notes such as Health, Condition:
poor……
Landuse Grazing
observed or Horticultural Crops ……..
Over fence or opposite sides road Similar vegetation over the road

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T35 Assessor: Ann Date : 19/01/2009

Location: Moonie Highway Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 250900 Northing: 7028656

Width of RE: 150-300m ;
Width of total remnant: >300 ;
Total RE Area: Does not extend beyond site; <1ha ; 1-5ha; 5-20ha ; 20-50ha ; >50ha
Total remnant Area: Does not extend beyond site; <1ha ; 1-5ha; 5-20ha ; 20-50ha ; >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.3.17		Of Concern
Survey result	11.3.17		Of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m. Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Casuarina cristata	A		20	15	10	5	2	*Cymbopogon refractus*	U
Acacia salicina	P					5	2	*Enteropogon acicularis*	U
Eucalyptus populnea	O			15				*Panicum decompositum*	P
Citrus glauca	P						2	*Paspalidium caespitosum*	O
Geijera parviflora	O						2	*Sporobolus australasicus*	P
Capparis lasiantha	P						1	*Einadia hastata*	U
								Enchylaena tomentosa	P
Canopy stratum (%) 70%									
Mid stratum (%) 30%									
Ground stratum (%) 5%									
Rock cover (%)									
Bare ground cover 5%									
Litter cover 90%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia aurantiaca
Opuntia tomentosa

Weed Cover (%): <5;

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: sandy clay loam;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3

Particular sensitivities to proposed impacts (incl. fragmentation):
Roadside edge effects
Special conservation significance:……
Other notes such as Health, Condition: poor most of the Eucalypts are dead or dying
Landuse Grazing
observed or Horticultural Crops ……..
Over fence or opposite sides road Similar vegetation over the road

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T36 Assessor: Ann Date : 19/1/2009

Location: Schultz Road Photo #: ……

GPS Projection: UTM Datum: ADG 84; Easting: 308250 Northing: 6975228

Width of RE: 35-75m ;
Width of total remnant: 35-75m ;
Total RE Area: 1-5ha;
Total remnant Area: 1-5ha;

	RE code	EPBC status	VMA status
DNRW RE map	11.4.10	Endangered	Endangered
Survey result	11.4.10	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 40%
Canopy Median Height: 25 m. Structural Code: Tall Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Casuarina cristata	C							*Paspalidium caespitosum*	O
Acacia harpophylla	C							*Yakirra majuscula*	O
Eucalyptus piligaensis	O							*Enchylaena tomentosa*	O
Geijera parviflora	O							*Sclerolaena calcarata*	O
Maireana microphylla	P							*Portulaca oleracea*	O
Casuarina cristata	C							*Dactyloctenium radulans*	P
Acacia harpophylla	C							*Eragrostis leptostachya*	P
Eucalyptus piligaensis	O							*Tragus australianus*	P
Geijera parviflora	O							*Walwhalleya subxerophila*	P
Maireana microphylla	P							*Brunoniella australis*	P
								Dianella revoluta v revoluta	P
								Carex inversa	P
								Tetragonia tetragonioides	U
								Enteropogon acicularis	U
								Einadia hastata	U
Canopy stratum (%)									
Mid stratum (%)									
Ground stratum (%)									
Rock cover (%)									
Bare ground cover (%)									
Litter cover (%)									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No /……

Additional notes on pest plants
Opuntia aurantiaca
Opuntia tomentosa

Weed Cover (%): <5

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: grayish;

Soil Texture: sandy clay;



Particular sensitivities to proposed impacts (incl. fragmentation): Narrow strip in places
Special conservation significance:……
Other notes such as Health, Condition: Poor Condition Eucalypts dying
Landuse Grazing
observed or Horticultural Crops ……..
Over fence or opposite sides road ……

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T37 Assessor: Ann Date : 19/01/2009

Location: Surat Development Road

GPS Projection: UTM Datum: ADG 84; Easting: 272672 Northing: 6977630

	RE code	EPBC status	VMA status
DNRW RE map	11.9.7		Of Concern
Survey result	11.9.7		Of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20 m. Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	T1	T2	T3	S1	S2	Ground Layer <1m	No.
Eucalyptus populnea	A		20	15				*Cymbopogon refractus*	O
Callitris glaucophylla	O			15	10			*Dichanthium sericeum*	O
Acacia leiocalyx ssp leiocalyx	O					5	2	*Enteropogon acicularis*	O
Eremophila mitchellii	O					5		*Eragrostis leptostachya*	O
Geijera parviflora	O						2	*Paspalidium caespitosum*	O
Acacia deanei ssp deanei	P						2	*Cymbopogon refractus*	O
Eucalyptus exserta	P				10			*Dichanthium sericeum*	O
Alectryon oleifolius ssp oleifolius	P					5		*Enteropogon acicularis*	O
Brachychiton populneus ssp trilobus	P						2	*Brunoniella australis*	P
Pimelea linifolia ssp linifolia	P						1	*Fimbristylis dichotoma*	P
Allocasuarina luehmannii	E					5		*Brunoniella australis*	P
								Eremophila debilis	P
								Dianella brevipedunculata	P
								Aristida caput-medusae	P
								Aristida jerichoensis	P
								Chloris divaricata	P
Canopy stratum (%) 70%								*Eragrostis elongata*	P
Mid stratum (%) 30%								*Panicum effusum v effusum*	U
Ground stratum (%) 80%								*Gahnia aspera*	U
Rock cover (%)									
Bare ground cover (%) 10%									
Litter cover (%) 10%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No

Additional notes on pest plants
Maynes Pest
Cenchrus ciliaris Buffel grass*

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3

Weed Cover (%): <1

Disturbance (% of site affected): 0,

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: grayish;

Soil Texture: silty clay loam;



Particular sensitivities to proposed impacts (incl. fragmentation): The surat development road fragments cuts the remnant in half with edge effects on both sides

Special conservation significance:……
Other notes such as Health, Condition: This remnant was in Good to Average condition

Landuse Grazing
observed or Horticultural Crops ……..
Over fence or opposite sides road Same vegetation on both sides of the road

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T 38 Assessor: Ann Date : 22/01/2009

Location: Gurulmundi S F Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 208488 Northing: 7065716

Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.10.1		Not of Concern
Survey result	11.10.1		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20 m Structural Code: Tall Open forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						
		E	T1	T2	T3	S1	S2	Ground Cover <1m
Corymbia citriodora ssp citriodora	C		25	20	15			*Brunoniella acaulis ssp acaulis*
Dodonaea triangularis	O							*Chloris divaricata v divaricata*
Eucalyptus fibrosa ssp nubilis	O			2 0	15			*Sporobolus australasicus*
Acacia buxifolia ssp pubiflora	P						2	*Thyridolepis mitchelliana*
Acacia conferta	P						2	*Einadia hastata*
Boronia glabra	P						2	*Goodenia boormanii*
Capparis canescens	P						2	*Dianella revoluta v revoluta*
Callitris glaucophylla	E					5	2	*Gahnia aspera*
Alphitonia excelsa	P						2	
Solanum nemophilum	U						<1	
Acacia shirleyi	C					8		
Canopy stratum (70%)								
Mid stratum (30%)								
Ground stratum (10%)								
Rock cover (70%)								
Bare ground cover (10%)								
Litter cover (10%)								

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
……

Additional notes on pest plants Nil

Weed Cover (%): <5

Disturbance (% of site affected): 0,

Health: Average

Slope: Ridge;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; orange;

Soil Texture: stony;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3



Particular sensitivities to proposed impacts (incl. fragmentation): Roads and tracks fragment area

Special conservation significance:……
Other notes such as Health, Condition:
Average……
Landuse Grazing, Logging, and Mining
Over fence or opposite sides road Grazing

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T39 Assessor: Ann Date : 22/01/2009

Location: Gurulmundi S F Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 797646 Northing: 7074257
Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.7.4		Not of Concern
Survey result	11.7.4		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 15 m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Acacia crassa ssp crassa	A						2	*Aristida caput-medusae*	O
Eucalyptus tenuipes	C		15		8			*Digitaria brownii*	P
Corymbia bloxsomei/watsoniana	E		15					*Enneapogon gracilis*	P
Sida subspicata	O						2	*Eragrostis setifolia**	O
Allocasuarina inophloia	O		15					*Paspalidium constrictum*	O
Acacia buxifolia ssp pubiflora	P						2	*Dampiera stricta*	P
Solanum nemophilum	P						<1	*Dianella revoluta v revoluta*	O
Lysicarpus angustifolius	P			10				*Seringia corollata*	U
Alphitonia excelsa	P						<1		
Canopy stratum (%) 30%									
Mid stratum (%)									
Ground stratum (%) 85%									
Rock cover (%)									
Bare ground cover 10%									
Litter cover 5%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants *Eragrostis setifolia**

Weed Cover (%): 5

Disturbance (% of site affected): 0;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: sand lateritic soil as photo below;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3



Acacia regrowth within Eucalyptus tenuipes woodland due to recently hot fire

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T40 Assessor: Ann Date : 22 /01/2009

Location: Sherwondal S F Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 794334 Northing: 7088471

Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.9.5/11.5.5	Endangered	Endangered/Not of Concern
Survey result	11.9.5	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 70%
Canopy Median Height: 20m Structural Code: Open Forest

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	T1	T2	T3	S1	S2	Ground Layer <1m	No.
Acacia harpophylla	C		20	15	10			*Ancistrachne uncinulata*	C
Eremophila mitchellii	O				8	5		*Enteropogon acicularis*	O
Callitris glaucophylla	O				10			*Paspalidium caespitosum*	U
Owenia acidula	O					5	2	*Tragus australianus*	O
Geijera parviflora	O				10		2	*Lomandra longifolia*	O
Atalaya hemiglauca	P					4	2	*Cyperus gracilis*	U
Capparis lasiantha	U						1	*Achyranthes aspera**	E
Acacia decora	U						2	*Nyssanthes erecta*	O
Eucalyptus populnea	E				10				
Senna artemisioides ssp zygophylla	U						2		
Canopy stratum (%) 70%									
Mid stratum (%) 30%									
Ground stratum (%) 10%									
Rock cover (%) 20%									
Bare ground cover 10%									
Litter cover 60%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants Nil Observed in transect

Weed Cover (%): 5

Disturbance (% of site affected): 0;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: brown;

Soil Texture: sandy clay loam;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3



Acacia harpophylla Brigalow open forest with *Eucalyptus populnea* on forest margins

Particular sensitivities to proposed impacts; Fragmentation
Other notes such as Health, Condition: poor lots of dead trees
Landuse Grazing and logging

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T41 Assessor: Ann Date : 22 /01/2009

Location: Glasby Road Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 772784 Northing: 7092902

	RE code	EPBC status	VMA status
DNRW RE map	11.9.4b	Endangered	Endangered
Survey result	No remnant accessible		

Canopy stratum form: Tree; Canopy Crown Cover:
Canopy Median Height: 15m Structural Code: Narrow strip <20m wide Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Casuarina cristata	C								
Eucalyptus populnea	P								
Geijera parviflora	U								

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants

Weed Cover (%): 5-25

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Crest escarpment

Soils: Surface observation **Reliability:** Low,

Soil Colour: Orange brown;

Soil Texture: Stony;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 – 50
O	Occasional	10 – 20
U	Uncommon	5 – 10
P	Present	3 – 5
R	Rare	1 – 3

Particular sensitivities to proposed impacts; Narrow strip less then 20 m wide
Other notes such as Health, Condition: poor Only couple of clumps
Landuse Grazing



Narrow strip less than 20m wide



Couple of clumps of vegetation in the Area

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T42 Assessor: Ann Date : 22 /01/2009

Location: Sundown Road Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 774532 Northing: 7097970

	RE code	EPBC status	VMA status
DNRW RE map	11.3.25/11.3.19/11.3.2		Not of Concern/Not of Concern/ Of Concern
Survey result	11.3.19		Not of Concern

Canopy stratum form: Tree; Canopy Crown Cover: 30%

Canopy Median Height: 15m Structural Code: Narrow strip Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Callitris glaucophylla	C			15	8	5	2	*Cenchrus ciliaris**	U
Corymbia tessellaris	O					5	2	*Heteropogon contortus*	P
Eucalyptus melanophloia	O		20		8	5	2	*Melinis repens**	U
Geijera parviflora	O						2	*Trichodesma zeylanicum*	U
Maireana microphylla	P						1	*Grewia retusifolia*	U
Grevillea striata	P						2	*Nyssanthes erecta*	O
Carissa ovata	U						1		
Acacia harpophylla	U						2		
Eucalyptus crebra	U					5			
Eucalyptus populnea	U					5			
Canopy stratum (%) 30%									
Mid stratum (%) 70%									
Ground stratum (%) 70%									
Rock cover (%) 20%									
Bare ground cover 5%									
Litter cover 5%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)

Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants

Weed Cover (%): 5-25

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Crest escarpment

Soils: Surface observation **Reliability:** Low,

Soil Colour: Orange brown;

Soil Texture: Stony;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 – 50
O	Occasional	10 – 20
U	Uncommon	5 – 10
P	Present	3 – 5
R	Rare	1 – 3

Particular sensitivities to proposed impacts; Narrow strip of re-growth tree
Other notes such as Health, Condition: poor lots of dead trees
Landuse Grazing and Quarrying area



Narrow strip of *Callitris glaucophylla* with larger *Eucalyptus melanophloia* and *Corymbia tessellaris* in the landscape

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T43 Assessor: Ann Date : 22 /01/2009

Location: Crossroads (No entrance) Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 768211 Northing: 7087574

	RE code	EPBC status	VMA status
DNRW RE map	11.7.2		Not of Concern
Survey result	Past Cleared		

Canopy stratum form: Tree; Canopy Crown Cover:
Canopy Median Height: 10m Structural Code: No Vegetation community

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Acacia harpophylla	P				10	8			
Eucalyptus populnea	R				10				
Citrus glauca	U						2		
Geijera parviflora	P					8			
Canopy stratum (%) %									
Mid stratum (%) %									
Ground stratum (%) %									
Rock cover (%) %									
Bare ground cover %									
Litter cover %									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants

Weed Cover (%):

Disturbance (% of site affected):

Health: Degraded

Slope: Undulating slpoes

Soils: Surface observation **Reliability:** Low,

Soil Colour: Orange brown;

Soil Texture: Stony;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 – 50
O	Occasional	10 – 20
U	Uncommon	5 – 10
P	Present	3 – 5
R	Rare	1 – 3



Scattered clumps of regrowth vegetation within the area

Particular sensitivities to proposed impacts; Fragmentation
Other notes such as Health, Condition: Couple of scattered clumps
Landuse Grazing areas

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T44 Assessor: Ann Date : 22 /01/2009

Location: Crossroads (No entrance) Photo #: 2

GPS Projection: UTM Datum: ADG 84; Zone 55 Easting: 283828 Northing: 7039365

	RE code	EPBC status	VMA status
DNRW RE map	11.9.6		Endangered
Survey result	11.4.3		Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 20m Structural Code: Open Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name		Rel. No.	Height Ocular estimate (m)						Ground Cover	
			E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Acacia harpophylla		C		20	15	10	8	2	*Tetragonia tetragonioides*	O
Casuarina cristata		E		20					*Einadia hastata*	O
Geijera parviflora		O					5	2	*Chloris divaricata*	O
Santalum lanceolatum		O					4	2	*Leptochloa digitata*	O
									Paspalidium caespitosum	O
									Sporobolus australasicus	O
									Sclerolaena calcarata	P
									Abutilon otocarpum	P
									Austrostipa verticillata	P
									Portulaca oleracea	P
									Roepera ammophila	P
Canopy stratum (%)	30%									
Mid stratum (%)	10%									
Ground stratum (%)	90%									
Rock cover (%)										
Bare ground cover	5%									
Litter cover	5%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants
**Opunita tomentosa*
**Carthamus lanatus*
**Atriplex muelleri*
**Salsola kali*
**Urochloa mosambicensis*

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 – 50
O	Occasional	10 – 20
U	Uncommon	5 – 10
P	Present	3 – 5
R	Rare	1 – 3

Weed Cover (%):

Disturbance (% of site affected):

Health: Degraded; Very open in the middle

Slope: Flat

Soils: Surface observation **Reliability:** Low,

Soil Colour: Black

Soil Texture: Cracking Clay



Particular sensitivities to proposed impacts; Fragmentation
Other notes such as Health, Condition: Couple of scattered clumps
Landuse Grazing areas

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T45 Assessor: Ann Date : 23/01/2009

Location: Jackson Wandoan Rd Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 781650 Northing: 7092189

Width of RE: >300
Width of total remnant: >300
Total RE Area: >50ha
Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.9.10		Of Concern
Survey result	11.9.5	Endangered	Endangered

Canopy stratum form: Tree; Canopy Crown Cover: 30%
Canopy Median Height: 20 m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Acacia harpophylla	C			15	10		2	*Ancistrachne uncinulata*	O
Eucalyptus orgadophila	E		20					*Aristida latifolia*	U
Carissa ovata	C						2	*Austrostipa verticillata*	O
Acacia decora	O						2	*Cymbopogon refractus*	U
Eremophila mitchellii	O				10	5		*Enteropogon acicularis*	O
Geijera parviflora	O					5	2	*Brunoniella australis*	U
Santalum lanceolatum	O						2	*Glossocardia bidens*	O
Senna artemisioides ssp zygophylla	P						2	*Einadia hastata*	U
Bursaria incana	P					5		*Sclerolaena calcarata*	U
Hakea lorea ssp lorea	P						1	*Portulaca pilosa*	P
Casuarina cristata	P		20					*Grewia retusifolia*	U
Psydrax attenuata forma attenuata	P						2	*Cyperus gracilis*	U
Atalaya salicifolia	P					4		*Nyssanthes erecta*	O
Alectryon diversifolius	P						2	*Parsonsia eucalyptophylla*	P
Sida subspicata	E						2		
Canopy stratum (%) 30%									
Mid stratum (%) 50%									
Ground stratum (%) 60%									
Rock cover (%) 10%									
Bare ground cover 20%									
Litter cover 10%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants
Opuntia tomentosa
*Cenchrus ciliaris**

Weed Cover (%): <5;

Disturbance (% of site affected): <1;

Health: Degraded

Slope: Flat;

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: sandy clay loam;

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3



Particular sensitivities to proposed impacts (incl. fragmentation):
Other notes such as Health, Condition: poor many dead trees as well as timber on ground
Landuse Grazing
Comment No *Eucalyptus populnea* observed within the section transected; Edge species present was *Euc orgadophila* Mountain Coolabah

Tertiary Site Vegetation Assessment Data Sheet Job Number: ……

Site Number: T46 Assessor: Ann Date : 23/01/2009

Location: Jackson Wandoan Road Photo #: 2

GPS Projection: UTM Datum: ADG 84; Easting: 779312 Northing: 7093643
Width of RE: >300m Width of total remnant: >300 Total RE Area: >50ha Total remnant Area: >50ha

	RE code	EPBC status	VMA status
DNRW RE map	11.9.6	Endangered	Endangered
Survey result	11.9.2		Not of Concern

Canopy stratum form: Tree Canopy Crown Cover: 70%
Canopy Median Height: 20 m Structural Code: Woodland

All woody species present within 50m x 10m plot (plus dominant and EVR non-woody species)

Name	Rel. No.	Height Ocular estimate (m)						Ground Cover	
		E	**T1**	**T2**	**T3**	**S1**	**S2**	**Ground Layer <1m**	**No.**
Eucalyptus orgadophila	C		20	15				*Ancistrachne uncinulata*	O
Callitris glaucophylla	C			15	10			*Aristida caput-medusae*	O
Corymbia erythrophloia	E					5		*Aristida latifolia*	O
Alectryon diversifolius	P					5		*Paspalidium caespitosum*	O
Alstonia constricta	P						2	*Portulaca pilosa*	P
Acacia cambagei	P						2	*Brunoniella australis*	O
Geijera parviflora	U						2	*Glossocardia bidens*	U
Atalaya salicifolia	U						2	*Carissa ovata*	P
Senna artemisioides ssp zygophylla	U						2	*Maireana microphylla*	O
								Sida subspicata	O
Canopy stratum (%) 70%									
Mid stratum (%) 30%									
Ground stratum (%) 5%									
Rock cover (%)									
Bare ground cover 5%									
Litter cover 90%									

*Species annotations: C Collected * Exotic Species ** Declared Species* E = *Edge or Outside but adjoining 50m x 10m plot Relative Numbers within stratum (*D = dominant; A = Abundant C = Common; O = Occasional; U = Uncommon; P =Present R = Rare)
Strata: E = Emergent; T1-3 = Tree strata 1-3; S1-2 = Shrub strata 1-2; G = Ground stratum\\

Scheduled flora possibilities: No
Additional notes on pest plants on Edge only
*Gomphocarpus physocarpus*Salsola kali* Cenchrus ciliaris**

	Description	Plants per plot
D	Dominant	>100
A	Abundant	50 - 100
C	Common	20 - 50
O	Occasional	10 - 20
U	Uncommon	5 - 10
P	Present	3 - 5
R	Rare	1 - 3

Weed Cover (%): <5;

Disturbance (% of site affected): <1;

Health: Average

Slope: upper slope

Soils: Surface observation **Reliability:** Low,

Soil Colour: yellow; brown;

Soil Texture: stony



***Eucalyptus orgadophila* Mountain Coolabah and Callitris glaucophylla**

Particular sensitivities to proposed impacts; Fragmentation
Other notes such as Health, Condition: Average
Landuse Grazing

ATTACHMENT 8 – EVR FLORA DATABASE SEARCH RESULTS

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat	Preferred Habitat Present	Source^
Waajie Wattle	*Acacia barakulensis*	V	-	Only known from Barakula State Forest	Yes	3
Brown Wattle	*Acacia brunioides*	R	-	Restricted to some mountain peaks in the southern Moreton district (Stanley and Ross, 1983).	Yes	3
Chinchilla Wattle	*Acacia chinchillensis*	V	V	Sandy soils. Widespread but uncommon.	Yes	1,2,3
Curly-bark Wattle	*Acacia curranii*	V	V	Only known from Gurulmundi wildflower area north of Miles.	Yes	1,2,3
Hando's Wattle	*Acacia handonis*	V	V	Understorey plant in *Eucalyptus* forests on sandstone ridges. Restricted to Barakula State Forest.	No	3
Tara Wattle	*Acacia lauta*	V	V	Found from Tara to Inglewood 1) Property "Marron Glen", 2) 15km nth of Tara and 3) 16km east of Tara.	Yes	1,2,3
Scrub Wattle	*Acacia tenuinervis*	R	-	Associated with red ridges. Recorded North of Glenmorgan along loamy ridges with spotted gum and narrow-leaf ironbark (Lester 2008)	Yes	2,3
None known	*Acacia wardellii*	V	V	Ridge crests with loamy or gravely soil. Coloniser of disturbed areas – Thomby Range and a few ridges east of the Condamine.	Yes	1,2,3
Queensland Lace Plant	*Aponogeton queenslandicus*	R	-	Inhabits temporary freshwater pools in watercourses and wetlands.	No	2,3
Sandstone Prickle-bush	*Apatophyllum terefolium*	R	-	Prickly 40cm herb found in woodland within RE 11.7.5, RE 11.10.1 and RE 11.10.13. Burnett and Leichardt Pastorals Districts.	Yes	2,3
Ooline	*Cadellia pentastylis*	V	V	Clay plains, sandstone and residual ridges in association with vine thickets,	Yes	1,2,3

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat	Preferred Habitat Present	Source^
				brigalow, belah and red bauhinia.		
Bailey's Cypress Pine	*Callitris baileye*	R	-	Hilly or mountainous areas often in the vicinity of dry vine forests.	No	3
Yellow Fringed Myrtle	*Calytrix gurulmundensis*	V	V	Found on lateritic sandstone ridges. Localised and patchy distribution.	Yes	1,2,3
Native Frangipani	*Cerbera dumicola*	R	-	Widespread in central Qld. Grows in vine thickets and lancewood (*Acacia shirley*) thickets (Forster, 1996).	No	3
Silver Commersonia	*Commersonia argentea*	-	V	Stony ridges, north of Chinchilla	Yes	1
None Known	*Cryptandra ciliata*	R	-	Know record at Gurulmundi State Forest (Qld Herbarium)	Yes	3
Small-leaved Denhamia	*Denhamia parvifolia*	V	V	Found in semi-evergreen vine thickets. Brown loam or clay loam soils.	Yes	1,3
King Blue Grass	*Dichanthium queenslandicum*	V	V	Endemic to Qld black soil plains. Occurs in REs 11.8.11, 11.3.21	No	1,3
Finger Panic	*Digitaria porrecta*	R	E	Grasslands and forests with grassy understorey. Known from RE 11.3.21	No	1,3
Tricolour Diuris	*Diuris tricolor (sheaffiana)*	-	V	Sandy soils, often in Callitris woodlands. Primarily a NSW species with scattered records in Qld.	Yes	1,2
Blake's Spikerush	*Eleocharis blakeana*	R	-	Known in wet poorly drained soils, records along Auburn Rd, Chinchilla and Lake Broadwater.	Yes	3
Queensland Western White Gum	*Eucalyptus argophloia*	V	V	Heavy clay soils. Populations NE of Chinchilla and Burra Burri.	No	3
Plunkett Mallee	*Eucalyptus curtisii*	R	-	Eucalypt forests, woodlands and shrublands on rocky slopes or on low poorly drained sites (Qld Herb., 2001).	Yes	2,3
Pumpkin Gum	*Eucalyptus pachycalyx*	R	-	On skeletal sandy soils (Botanic Gardens	Yes	3

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat	Preferred Habitat Present	Source^
				Trust, 2009)		
Woollybark	*Eucalyptus rubiginosa*	R	-	Type was collected within Ironbark and Yellow Bloodwood community (Brooker 1984)	Yes	3
Shiny-leaved Ironbark	*Eucalyptus virens*	V	V	Sandstone ridges. Four populations – 1) Coolmunda Conservation Park 2) Tara, 3) NE of Eidsvold and 4) Maranoa River near Mt Moffatt.	Yes	1,2,3
Rare Fringe-rush	*Fimbristylis vagans*	R	-	Wet creek/drainage lines Wetland plant recorded in the nearby Lake Broadwater area.	Yes	2,3
None Known	*Gonocarpus urceolatus*	V	-	Recorded near Chinchilla on heavy loam soils.	Yes	2,3
None Known	*Grevillea singuliflora*	R	-	Sandy, sandstone and rocky areas.	Yes	3
None Known	*Homopholis belsonii*	E	V	Dry woodland on sandy soils.	Yes	1,3
None Known	*Homoranthus decumbens*	V	V	Found in two separate locations 1) Blackdown Tablelands and 2) State Forest 302, north of Chinchilla.	Yes	3
Basalt PATPer-cress	*Lepidium hyssopifolium*	-	E	Occurs beneath large trees in grassy woodlands where trees are restricting groundlayer competition. Also known in grasslands. Absent where vegetation groundcover is complete and in areas subject to heavy grazing (DPIWE, undated).	No	2
None Known	*Melaleuca groveana*	R	-	Occurs on ridges, high mountain slopes and mountain summits in heaths and eucalypt woodland and forests with heath understories (DNR, 1999).	Yes	3
Gurulmundi Heath-myrtle	*Micromyrtus carinata*	E	-	Type collected from Gurulmundi SF	Yes	2,3

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat	Preferred Habitat Present	Source^
None Known	*Micromyrtus patula*	E	-	Laterised sandstone areas. Type collected in Barakula State Forest.	Yes	3
None Known	*Notelaea pungens*	R	-	Known Herbarium recodes Barakula State Forest Chinchilla in open Eucalypt Forest (Guymer, 1987)	Yes	3
None Known	*Philotheca sporadica*	V	V	On residual lateritic rises. 1) north of Tara and 2) 12km east of Kogan.	Yes	1,2,3
None Known	*Prostanthera sp. (Dunmore D.M.Gordon 8A)*	V	V	Restricted to three sites near Millmerran. Open forest on stony ridges.	No	3
Cobar Greenhood Orchid	*Pterostylis cobarensis*		V	Stony ridges. Nyngan-Cobar-Burke region.	No	1,3
None Known	*Rutidosis glandulosa*	R	-	Recorded from Barakula State Forest (Kokubugata & Holland 2002)	Yes	3
None Known	*Rutidosis lanata*	E	-	Occurs in Eucalypt and Acacia forests. Two populations known 1) near Jackson and 2) near Meandarra.	Yes	2,3
None Known	*Senna acclinis*	R	-	Rainforest margins and adjacent open forest between 100 to 660 m altitude and in association with *Pleiogynium timorense*, *Elattostachys* spp., *Eucalyptus grandis* and *Syncarpia glomulifera* (DNR, 1999).	No	3
None Known	*Solanum papaverifolium*	E	-	Heavy black soils (Stanley and Ross, 1986).	Yes	3
None known	*Solanum stenopterum*	V	-	Cracking clay soils in vine thickets, woodlands and	Yes	1
Austral Cornflower	*Rhaponticum australis*	V	V	Open grasslands on black soil. Locally common in undisturbed grasslands. Usually in vicinity of basalt geologies	No	1

Common Name	Scientific Name	NCA	EPBC	Preferred Habitat	Preferred Habitat Present	Source^
Toadflax	*Thesium australe*	V	V	Localised populations in grasslands and grassy woodlands.	No	1
None Known	*Westringia parvifolia*	V	V	Stony and gravely soils. Woodlands and forests.	No	1
Durong Sage	*Xerothamnella herbacea*	E	E	Found in Brigalow and low Chenopod shrubland. Records from Pelican Black Rd Chinchilla and Theodore State Forest (Qld Herbarium)	No	3

*Status: NCA: State listed E = Endangered; V = Vulnerable; R = Rare
EPBC: Australian Government listed: E = Endangered; V = Vulnerable
^: Source: 1 = EPBC Protected Matters search; 2 = WildNet; 3 = Herbrecs

ATTACHMENT 9 - COMPLETE FLORA LIST FOR CSG FIELD

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Abutilon oxycarpum				WIEAMBILLA CK
Acacia amblygona	Scrambling Wattle		GURULMUNDI CONDAMINE	
Acacia aprepta	Miles Mulga		CONDAMINE MARMADUA	
Acacia bancroftiorum	Bancroft's Wattle	T12	BRAEMAR	
Acacia blakei ssp blakei	Blake's Wattle		GURULMUNDI	
Acacia burrowii	Lancewood		BRAEMAR CONDAMINE MARMADUA	
Acacia buxifolia	Box-leaf Wattle		GURULMUNDI MARMADUA	SIXTEEN MILE CK
Acacia caroleae	Carol's Wattle		GURULMUNDI CONDAMINE MARMADUA	
Acacia chinchillensis	**Chinchilla Wattle**	**T21, T23**		**WILKIE CK**
Acacia complanata	Flat-stem Wattle		GURULMUNDI	
Acacia conferta	Crowded-leaf Wattle	T5,T15,T19	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	SANDY CK
Acacia crassa ssp crassa	Curracabah	T5,T6,T10,T15	BRAEMAR GURULMUNDI CONDAMINE	
Acacia curranii	**Curran's Wattle**	**T20**	**GURULMUNDI**	
Acacia deanei ssp deanei	Deanes Wattle	T9,T12	CONDAMINE MARMADUA	
Acacia debilis	Wattle		CONDAMINE	
Acacia decora	Pretty Wattle	T12	CONDAMINE MARMADUA	
Acacia everistii	Wattle		CONDAMINE	WIEAMBILLA CK
Acacia excelsa	Ironwood	T7	GURULMUNDI CONDAMINE MARMADUA	
Acacia falcate	Sickle Wattle		GURULMUNDI CONDAMINE	
Acacia hakeoides	Western Hakea Wattle		CONDAMINE	
Acacia harpophylla	Brigalow	T4,T8,T9,T11	BRAEMAR CONDAMINE MARMADUA	WIEAMBILLA CK
Acacia ixiophylla	Umbrella Wattle		GURULMUNDI	
Acacia julifera ssp julifera	Catkin Wattle		GURULMUNDI	
Acacia juncifolia	Rush-leaf Wattle		GURULMUNDI CONDAMINE	
Acacia leiocalyx ssp leiocalyx	Early-flowering Wattle	T12,T13,T14, T15	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	SANDY CK
Acacia leptostachya		T3		SIXTEEN MILE CK WAMBO CK
Acacia longispicata	Wattle		GURULMUNDI	
Acacia melvillei	Yarran		MARMADUA	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Acacia muelleriana	Mueller's Wattle	T23	BRAEMAR CONDAMINE	WILKIE CK
Acacia neriifolia	Oleander Wattle		BRAEMAR GURULMUNDI CONDAMINE	
Acacia omalophylla				SIXTEEN MILE CK
Acacia pendula	Weeping Myall		MARMADUA	
Acacia penninervis	Mountain Hickory		GURULMUNDI	
Acacia salicina	Sally Wattle	T3	GURULMUNDI MARMADUA MARMADUA	SIXTEEN MILE CK WIEAMBILLA CK
Acacia semilunata	Crescent-leaved Wattle	T19	BRAEMAR MARMADUA	NINE MILE CK
Acacia semirigida	Stony-ridge Wattle		CONDAMINE	
Acacia shirleyi	Lancewood	T5	GURULMUNDI CONDAMINE MARMADUA	
Acacia sparsiflora	Currawong		GURULMUNDI	
Acacia spectabilis	Glory Wattle	T10	GURULMUNDI CONDAMINE MARMADUA	WILKIE CK
Acacia striatifolia	Wattle		GURULMUNDI	
Acacia triptera	Spur-wing Wattle	T15	BRAEMAR GURULMUNDI CONDAMINE	
Acacia wardellii	**Vulnerable Wattle**	**T24, T30**	**CONDAMINE**	
Adiantum aethiopicum	Common Maidenhair		GURULMUNDI	
Alectryon diversifolius	Scrub Boonaree	T8,T9	BRAEMAR CONDAMINE	
Allocasuarina inophloia	Thready-barked Sheoak	T15	BRAEMAR GURULMUNDI CONDAMINE	
Allocasuarina luehmannii	Bull Oak	T6,T7,T10,T12,T14,T21,T23	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Alphitonia excelsa	Soapy or Red Ash	T15	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	
Alstonia constricta	Bitter Bark Quinine Tree		GURULMUNDI	
Amyema cambagei	Needle-leaved mistletoe		MARMADUA	WIEAMBILLA CK
Amyema linophyllum	Bulloak Mistletoe		CONDAMINE	WIEAMBILLA CK
Amyema quandang v quandang		T11		
Ancistrachne uncinulata		T12		
Angophora floribunda	Rough-bark Apple	T3	GURULMUNDI MARMADUA	WAMBO CK WIEAMBILLA CK
Angophora leiocarpa	Smooth-barked Apple	T5,T10,T19,T21	BRAEMAR GURULMUNDI CONDAMINE	WIEAMBILLA CK

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
			MARMADUA	
Anthobolus leptomerioides	Desert Broom Bush		GURULMUNDI	
Aristida benthamii v spinulifera		T5		
Aristida caput-medusae	Many Headed Wire-Grass	T4,T5,T10,T14,T15	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Aristida holathera			BRAEMAR CONDAMINE	
Aristida inaequiglumis	Feathertop Three-awn		CONDAMINE	
Aristida latifolia	Feathertop Wire-grass		BRAEMAR CONDAMINE MARMADUA	
Aristida leptopoda	White Spear-grass	T4,T5,T6,T7, T10,T13,T15, T19	BRAEMAR	SIXTEEN MILE CK
Aristida ramosa v ramosa				SIXTEEN MILE CK
Aristida vagans		T6		
Arundinella nepalensis		T1,T3,T14		
Atriplex muelleri		T8		
Austrostipa ramosissima	Stout Bamboo Grass		MARMADUA	
Babingtonia densifolia	Cluster-leaf Myrtle		GURULMUNDI	
Babingtonia jucunda	Rare Twiggy Myrtle	T23	CONDAMINE	WILKIE CK
Boronia bipinnata v bipinnata	Rock Boronia	T6,T10,T19	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	NINE MILE CK
Boronia glabra	Sandstone Boronia		GURULMUNDI CONDAMINE	
Boronia splendida	Splendid Boronia		CONDAMINE	
Bothriochloa decipiens		T3	GURULMUNDI	WIEAMBILLA CK SIXTEEN MILE CK
Brachychiton populneus	Little Kurrajong		BRAEMAR MARMADUA	WIEAMBILLA CK
Brachyscome microcarpa	Bright Eyes		GURULMUNDI	
Brachyscome sp		T23		WILKIE CK
Brunonia australis	Blue Pincushion		GURULMUNDI	
Brunoniella australis	Blue Trumpet	T4,T6,T7,T11,T25	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	SIXTEEN MILE CK
Bryophyllum delagoense	Mother of Millions		BRAEMAR	
Bryophyllum tubilforum				WAMBO CK
Bursaria spinosa sp spinosa	Prickly Blackthorn		BRAEMAR CONDAMINE MARMADUA	
Caladenia caerulea	Blue Fingers	T10	GURULMUNDI CONDAMINE	
Caladenia carnea	Pink Fingers		GURULMUNDI MARMADUA	
Caleana minor	Small Duck Orchid			

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Callitris endlicheri	Black Cypress		GURULMUNDI	
Callitris glaucophylla	White Cypress Pine	T3,T5,T7,T10 ,T13,T14,T15 ,T19,T21,T23	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Calochilus campestris	Copper Beard-Orchid		GURULMUNDI	
Calotis cuneata v cuneata	Burr Daisy		BRAEMAR CONDAMINE	
Calotis dentex	White Burr Daisy	T4,T12	BRAEMAR CONDAMINE	SIXTEEN MILE CK
Calotis lappulacea	Yellow Burr Daisy		BRAEMAR CONDAMINE	
Calyptochloa gracillima	Tableland Couch	T5	BRAEMAR CONDAMINE MARMADUA	
Calytrix gurulmundensis	**Yellow Fringed Myrtle**	**T22**	**GURULMUNDI**	
Calytrix longiflora	Fringed Myrtle		GURULMUNDI	
Calytrix tetragona	Common Fringed Myrtle		GURULMUNDI CONDAMINE	
Capparis lasiantha		T9		
Capparis loranthifolia	Narrow-leafed Bumble	T25	MARMADUA	
Capparis mitchellii	Wild Native Orange	T3		WIEAMBILLA CK SIXTEEN MILE CK
Carissa ovata	Currant Bush	T9,T12	MARMADUA	
Casuarina cristata	Belah	T9,T11,T25	BRAEMAR CONDAMINE MARMADUA	WIEAMBILLA CK
Casuarina cunninghamiana				SIXTEEN MILE CK
Cheilanthes distans	Bristly Cloak Fern	T10,T14	CONDAMINE MARMADUA	WIEAMBILLA CK
Cheilanthes sieberi	Mulga Fern	T12,T15	BRAEMAR	WIEAMBILLA CK
Cheilanthes tenuifolia	Rock Fern	T15	BRAEMAR	
Chorizema parviflorum	Eastern Flame Pea		GURULMUNDI	
Chrysocephalum apiculatum	Yellow Buttons	T14,T15,T21, T23	BRAEMAR CONDAMINE GURULMUNDI MARMADUA	
Citrus glauca	Inland Lime	T9,T11,T25		WIEAMBILLA CK
Commersonia pedleyi	Pink Commersonia		GURULMUNDI	
Corymbia bloxsomei	Yellow Jacket		GURULMUNDI	
Corymbia citriodora ssp variegata	Spotted Gum	T12	BRAEMAR GURULMUNDI CONDAMINE	
Corymbia clarksoniana	Clarkson's Bloodwood		GURULMUNDI CONDAMINE MARMADUA	
Corymbia polycarpa		T13		
Corymbia tessellaris	Moreton Bay Ash	T1,T13,T14	GURULMUNDI CONDAMINE	WIEAMBILLA CK
Corymbia trachyphloia	Brown Bloodwood	T15	BRAEMAR GURULMUNDI CONDAMINE	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Cryptandra armata	Prickly Bitter Cryptandra	T10	GURULMUNDI	
Cryptandra ciliata	Rare Cryptandra		GURULMUNDI	
Cryptandra longistaminea	New England Cryptandra		CONDAMINE	
Cymbidium canaliculatum	Black Orchid	T10,T13	GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Cymbopogon refractus	Barbwire Grass	T7,T9,T14	CONDAMINE MARMADUA	SANDY CK
Cynodon dactylon				SIXTEEN MILE CK
Cyperus bifax		T8		
Cyperus concinnus		T21		
Cyperus gracilis		T25		
Cyperus polystachyos		T1		WAMBO CK
Dampiera adpressa	Bushy Dampiera		GURULMUNDI	
Dampiera discolor	Fanflower		GURULMUNDI	
Dampiera stricta	Wallum Dampiera		GURULMUNDI	
Daviesia genistifolia	Broom Bitter-pea	T23	CONDAMINE	WILKIE CK
Daviesia ulicifolia		T12		
Daviesia villifera	Golden Pea		GURULMUNDI	
Desmodium brachypodum	Large Ticktrefoil			WIEAMBILLA CK
Dianella brevipedunculata	Clumping Flax Lily			WIEAMBILLA CK
Dianella longifolia v longifolia	Pale Flax Lily		GURULMUNDI	WIEAMBILLA CK
Dianella revoluta v revoluta	Spreading Flax Lily	T4,T7,T8,T10 ,T14,T21	BRAEMAR CONDAMINE MARMADUA	
Dichanthium sericeum				WIEAMBILLA CK
Digitaria divaricatissima	Umbrella Grass	T4,T6,T8,T11 ,T21	BRAEMAR	
Dillwynia retorta	Twisted Parrot Pea		GURULMUNDI	
Dipodium hamiltonianum	Yellow Hyacinth Orchid		GURULMUNDI	
Dodonaea biloba	Rare Hop-bush		GURULMUNDI	
Dodonaea boroniifolia	Fern-leaf Hop-bush		CONDAMINE	
Dodonaea macrossanii	Inland Hop-bush	T10,T21	CONDAMINE	
Dodonaea triangularis	Fan Hop-bush		BRAEMAR GURULMUNDI CONDAMINE MARMADUA	
Dodonaea vestita	Hop-bush		GURULMUNDI	
Dodonaea viscosa ssp spatulata	Sticky Hop-bush	T9,T13	BRAEMAR GURULMUNDI MARMADUA	
Drosera auriculata	Tall Sundew		GURULMUNDI	
Drosera binata	Forked Sundew		GURULMUNDI	
Drosera burmanni	Tropical Sundew		GURULMUNDI	
Drosera glanduligera	Pimpernel Sundew		GURULMUNDI	
Drosera peltata	Pale Sundew		GURULMUNDI	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Einadia hastata		T11		KENYA CAMP CREEK
Einadia nutans ssp nutans	Climbing Saltbush	T6,T8,T25	BRAEMAR	
Enchylaena tomentosa v glabra	Ruby Saltbush	T8,T11,T14,T25	BRAEMAR	SANDY CK
Enneapogon nigricans		T12		
Enteropogon acicularis	Curly Windmill Grass	T9,T13,T14T15,T25	BRAEMAR MARMADUA	SIXTEEN MILE CK
Entolasia stricta	Wiry Panic	T10	CONDAMINE	
Eragrostis elongata	Clustered Love Grass	T15	BRAEMAR	
Eragrostis leptocarpa		T7		
Eragrostis leptostachya		T4		SIXTEEN MILE CK
Eragrostis sororia	Love Grass		BRAEMAR	
Eragrostis sororia		T4,T15,T21		SIXTEEN MILE CK
Eremophila debilis	Winter Apple		BRAEMAR	
Eremophila deserti	Turkey Bush		MARMADUA	
Eremophila mitchellii	False Sandalwood	T3,T9,T11,T13	CONDAMINE	WIEAMBILLA CK
Eucalyptus apothalassica	Gum		GURULMUNDI	
Eucalyptus camaldulensis	River Red Gum			WIEAMBILLA CK
Eucalyptus chloroclada	Dirty Gum	T14,T19	GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Eucalyptus coolabah	Coolibah	T11,T13		WIEAMBILLA CK
Eucalyptus crebra	Narrow-leaved Ironbark	T5,T10,T12,T21,T23	BRAEMAR MARMADUA	WIEAMBILLA CK
Eucalyptus curtisii	**Plunkett Mallee**		**GURULMUNDI**	
Eucalyptus decorticans	Gum-top Ironbark		BRAEMAR CONDAMINE MARMADUA	
Eucalyptus exserta	Qld PATPermint	T5,T10	GURULMUNDI CONDAMINE	
Eucalyptus fibrosa ssp nubilis	Blue-top Ironbark	T5,T7,T15,T19	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	NINE MILE CK
Eucalyptus moluccana		T4		SIXTEEN MILE CK
Eucalyptus piligaensis	Narrow-leaved Box	T7,T9,T15,T25	BRAEMAR CONDAMINE	NINE MILE CK
Eucalyptus populnea	Bimble Box	T3,T6,T7,T11,T12,T13,T14,T25	MARMADUA MARMADUA	WIEAMBILLA CK
Eucalyptus tenuipes	Narrow-leaved Mahogany		GURULMUNDI	
Eucalyptus tereticornis	Qld Blue Gum	T3,T14	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	WIEAMBILLA CK
Fimbristylis bisumbellata	Fringe-rush	T23	MARMADUA	WILKIE CK
Fimbristylis dichotoma		T7		
Gahnia aspera	Sword-sedge	T4,T12,T15,T	BRAEMAR	SIXTEEN MILE CK

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
		19	GURULMUNDI CONDAMINE MARMADUA	
Geijera parviflora	Wilga	T3,T7,T8,T9, T11,T12,T15, T25	BRAEMAR CONDAMINE MARMADUA	WIEAMBILLA CK
Gomphocarpus physocarpus	Balloon Cotton		MARMADUA	
*Gomphrena celosioides**	Soft Khaki Weed			WIEAMBILLA CK
Goodenia boormanii	Fan Flower		GURULMUNDI	
Goodenia glabra	Smooth Goodenia	T4	GURULMUNDI	SIXTEEN MILE CK
Goodenia paniculata	Branched Goodenia		BRAEMAR	
Goodenia rotundifolia	Star Goodenia		GURULMUNDI	
Grevillea floribunda	Seven Dwarfs Grevillea		GURULMUNDI	
Grevillea longistyla	Elegent Grevillea		GURULMUNDI	
Grevillea striata	Beefwood		BRAEMAR GURULMUNDI CONDAMINE	
Hakea leucoptera ssp leucoptera	Silver Needlewood		CONDAMINE	
Hakea lorea ssp lorea	Corkwood		CONDAMINE MARMADUA	
Hakea purpurea	Crimson Hakea		GURULMUNDI CONDAMINE	
Hakea tephrosperma	Hooked Needlewood		CONDAMINE	
Hardenbergia violacea	False Sarsparilla		GURULMUNDI CONDAMINE	WIEAMBILLA CK
Hedychium coronarium		T13		
Heteropogon contortus	Bunch Speargrass		MARMADUA	
Hibbertia acicularis	Prickly Guinea Flower		GURULMUNDI	
Hibbertia cistoidea	Guinea Flower		GURULMUNDI	
Hibbertia stricta	Erect Guinea Flower		BRAEMAR GURULMUNDI	
Hibiscus sturtii v sturtii	Sturts Hibiscus		GURULMUNDI	
Homalocalyx polyandrus	Homalocalyx		BRAEMAR GURULMUNDI CONDAMINE MARMADUA	
Homoranthus melanostictus	Inland Mouse Plant		GURULMUNDI	
Hovea lanceolata	Lance-leaf Hovea		GURULMUNDI	
Hybanthus enneaspermus	Spade Flower		MARMADUA	
Hypoxis hygrometrica v villosisepala	Golden Weather Glass	T8	GURULMUNDI	SIXTEEN MILE CK
Imperata cylindrica	Blady Grass	T3		WIEAMBILLA CK SIXTEEN MILE CK
Indigofera australis v australis	Austral Indigo		CONDAMINE	
Isoetopsis graminifolia	Grass Cushions		GURULMUNDI	
Jacksonia rhadinoclona	Turner's or Miles Dogwood		GURULMUNDI	
Jacksonia scoparia	Broome		GURULMUNDI	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
			CONDAMINE	
Jacksonia stackhousii	Wallum Dogwood		GURULMUNDI	
Jasminum didymum ssp didymum		T9		
Juncus continuus	Common Rush	T3	GURULMUNDI	SIXTEEN MILE CK WAMBO CK
Juncus planifolius		T4		SIXTEEN MILE CK
Korthalsella taenioides	Ribbon-semmed Mistletoe		GURULMUNDI	
Kunzea opposita	Mauve Flowered Kunzea		GURULMUNDI	
Laxmannia gracilis	Slender Wire-lily		BRAEMAR GURULMUNDI MARMADUA	
Leptochloa decipiens	Slender Cane Grass		MARMADUA	WIEAMBILLA CK
Leptochloa digitata				SIXTEEN MILE CK
Leptospermum polygalifolium	Yellow Tea-tree	T1,T15	BRAEMAR GURULMUNDI	WIEAMBILLA CK
Leucopogon biflorus	Twin-flowered Heath	T23	GURULMUNDI CONDAMINE	
Leucopogon blakei	Beard-heath		GURULMUNDI	
Leucopogon muticus		T23		WILKIE CK
Leucopogon pleiospermus	Beard-heath	T23	GURULMUNDI CONDAMINE MARMADUA	WILKIE CK
Lissanthe pluriloculata	Lissanthe		GURULMUNDI	
Lobelia andrewsii	Trailing Lobelia		GURULMUNDI	
Lomandra leucocephala	Woolly Mat-rush	T23	CONDAMINE	WILKIE CK WAMBO CK
Lomandra longifolia	Spiny Headed Mat-rush	T1,T4,T7,T10 ,T12,T15,T19	BRAEMAR CONDAMINE MARMADUA	
Lomandra multiflora	Many Flowered Matrush		MARMADUA	
Lysiana exocarpi ssp tenuis	Harlequin Mistletoe		BRAEMAR	
Lysicarpus angustifolius	Tom Russell's Mahogany	T15	BRAEMAR GURULMUNDI CONDAMINE MARMADUA	
Marsilea hirsuta		T8		
Megathyrsus maximus v pubiglumis		T9		
Melaleuca decora	White Feather Honeymyrtle	T10,T23	BRAEMAR CONDAMINE	WILKIE CK
Melaleuca thymifolia	Thyme-leaved Paperbark		GURULMUNDI CONDAMINE	
Melaleuca uncinata	Broombush		GURULMUNDI CONDAMINE	
Melichrus erubescens	Ruby Urn Heath		GURULMUNDI	
Melichrus urceolatus	Cream Urn heath	T23	GURULMUNDI CONDAMINE MARMADUA	WILKIE CK

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Micromyrtus albicans	Heath-myrtle		CONDAMINE	
Micromyrtus carinata	**Gurulmundi myrtle**		**GURULMUNDI**	
Micromyrtus ciliata	Fringed Heath-myrtle		GURULMUNDI	
Micromyrtus hexamera		T10		
Micromyrtus patula	Endangered Heath-myrtle		GURULMUNDI	
Micromyrtus sessilis	Heath-myrtle		GURULMUNDI	
Micromyrtus striata		T5		
Mimulus gracilis	Slender Monkey Flower		CONDAMINE MARMADUA	
Mirbelia aotoides	Northern Mirbelia		GURULMUNDI	
Mirbelia pungens	Prickly Mirbelia	T10	GURULMUNDI CONDAMINE	
Myoporum acuminatum		T9,T13		
Notelaea microcarpa v microcarpa	Small-fruit Mock-olive		CONDAMINE	
Nyssanthes erecta	Nyssanthes	T25	MARMADUA	
Olearia canescens	New England Daisy-bushes		GURULMUNDI	
Olearia ramosissima	Moss Daisy-bushes		CONDAMINE	
*Opuntia stricta v stricta**	Prickly Pear			WIEAMBILLA CK
*Opuntia tomentosa**	Velvety Tree Pear	T6,T10	CONDAMINE MARMADUA	
Owenia acidula		T13		
Oxalis corniculata	Creeping Oxalis	T15	BRAEMAR	WIEAMBILLA CK
Ozothamnus diosmifolius	Sago Flower		GURULMUNDI CONDAMINE	
Ozothamnus diotophyllus	Heath Everlasting		GURULMUNDI CONDAMINE	
Panicum decompositum			BRAEMAR CONDAMINE	
Panicum effusum v effusum	Hairy Panic	T12,T15,T21	BRAEMAR CONDAMINE	
Panicum subxerophilum		T6,T11		
Paspalidium caespitosum		T4,T9,T11,T13		SIXTEEN MILE CK
Petalostigma pubescens		T15		
Petalostigma pubescens	Hairy Quinine Tree		BRAEMAR GURULMUNDI CONDAMINE MARMADUA	
Philotheca sporadica	**Vulnerable Waxflower**	**T5,T10**	**MARMADUA**	
Phragmites australis	Common Reed	T3	MARMADUA	SIXTEEN MILE CK
Pimelea linifolia	Common Rice-flower		GURULMUNDI	
Pimelea linifolia ssp collina	Swamp Rice-flower		GURULMUNDI	
Pimelea neoanglica	Scanty Rice-flower	T9,T12	GURULMUNDI	
Platysace ericoides	Platysace		GURULMUNDI	
Podolepis longipedata	Tall Copper-wire Daisy	T1,T15	BRAEMAR	WAMBO CK
Polygala linariifolia	Milkwort		GURULMUNDI	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
Pomaderris queenslandica	Qld Pomaderris		GURULMUNDI	
Pomax umbellata	Pomax	T15,T23	BRAEMAR	WILKIE CK
Portulaca oleracea	Common Pigweed		BRAEMAR	
Prostanthera aspalathoides	Scarlet Mint Bush		GURULMUNDI	
Prostanthera euphrasioides	Eye Bright Mint Bush		GURULMUNDI	
Prostanthera parvifolia	Small-leaved Mint Bush		GURULMUNDI MARMADUA	
Prostanthera ringens	Leichhardt's Mint Bush		GURULMUNDI CONDAMINE MARMADUA	
Pseuderanthemum variabile	Love Flower		GURULMUNDI	
Psydrax oleifolia	Myrtle Tree			WIEAMBILLA CK
Pterostylis bicolor	Midget Greenhood		GURULMUNDI	
Pultenaea microphylla		T14		SANDY CK
Pultenaea petiolaris	Small Rayed Bush-pea		GURULMUNDI	
*Richardia brasiliensis**	White Eye	T3		WIEAMBILLA CK SIXTEEN MILE CK
Rostellularia adscendens	Pink Tongues		GURULMUNDI	
Rulingia sp(Westmar L Pedley518)	Kerrawang		GURULMUNDI	
Salsola kali	Soft Roly-poly	T8,T14	BRAEMAR CONDAMINE MARMADUA	SANDY CK
Santalum lanceolatum	Plumbush	T8,T9	CONDAMINE MARMADUA	WIEAMBILLA CK
Sarcostemma viminale ssp brunonianum		T8		
Schoenus apogon	Fluke Bogrush		GURULMUNDI CONDAMINE	
Scleria mackaviensis			BRAEMAR	
Scleria sphacelata	Rainforest Sedge		BRAEMAR CONDAMINE	
Senecio lautus ssp lautus	Variable Groundsel		BRAEMAR MARMADUA	
Senna aciphylla	Sprawling Cassia		CONDAMINE MARMADUA	
*Senna barclayana**	PATPer-leaved Senna			WIEAMBILLA CK
Senna occidentalis		T9		
Seringia corollata	Kerauderenia		GURULMUNDI	
Setaria pumila ssp pallide-fusca				WAMBO CK
Sida fibulifera	Silver Sida		CONDAMINE	
Sida rhombifolia			CONDAMINE BRAEMAR	SIXTEEN MILE CK
*Sida spinosa**	Spiny Sida		CONDAMINE	
Sida subspicata	Qld Hemp	T12	CONDAMINE MARMADUA	
Sida trichopoda			BRAEMAR	
Solanum jucundum	Nightshade		GURULMUNDI	
Solanum nemophilum	Forest Nightshade	T11,T12	BRAEMAR GURULMUNDI	

SPECIES NAME	COMMON NAME	SITES	STATE FOREST	WATER COURSES
			CONDAMINE	
Sporobolus fertilis		T7		SIXTEEN MILE CK
Stylidium eglandulosum	Woolly-stemmed Triggerplant		GURULMUNDI CONDAMINE	
Tephrosia brachyodon	Red Pea-bush		CONDAMINE	
Tetragonia tetragonioides	New Zealand Spinach	T8,T11	BRAEMAR MARMADUA	SIXTEEN MILE CK
Themeda triandra	Kangaroo Grass	T7	BRAEMAR	
Thyridolepis mitchelliana		T10		
Trachymene ochracea	White Parsnip		GURULMUNDI	
Trema tomentosa v viridis	Poison Peach		GURULMUNDI	
Triodia longiceps		T12		
Triodia scariosa	Porcupine Grass		GURULMUNDI MARMADUA	
*Urochloa mosambicensis**		T8,T13		
Velleia lyrata	Velleia		GURULMUNDI	
Velleia paradoxa	Spur Velleia		GURULMUNDI CONDAMINE	
Ventilago viminalis	Vine Tree	T13		
*Verbena tenuisecta**	Mayne's Pest	T8,T12	CONDAMINE	WAMBO CK
Viscum articulatum	Leafless Jointed Mistletoe		GURULMUNDI	
Wahlenbergia communis	Grass-leaf Bluebells		CONDAMINE	
Wahlenbergia graniticola	Granite Bluebells			WIEAMBILLA CK
Westringia cheelii	Westringia		GURULMUNDI CONDAMINE	
Wikstroemia indica	Tie Bush		BRAEMAR	
Wurmbea dioica ssp dioica	Early Nancy		GURULMUNDI	
Xanthorrhoea johnsonii	Forest Grass Tree		GURULMUNDI CONDAMINE	
Xylomelum cunninghamianum	Woody Pear		GURULMUNDI	
Zieria aspalathoides	Whorled Heathy Zieria		GURULMUNDI	
Zieria sp (White Mt D.G.Fell+ DGF1257)	White Mt Zieria		GURULMUNDI	
Zygophyllum apiculatum		T8		

ATTACHMENT 10 - COMPLETE FAUNA LIST FOR CSG FIELD

Common Name	*Scientific Name*	Record**
Insects		
Imperial Hairstreak Butterfly	*Jalmenus evagoras eubulus*	1,2
Fish		
Agassiz's Glassfish	*Ambassis agassizii*	1
Goldfish*	*Carassius auratus*	1
Flyspecked Hardyhead	*Craterocephalus stercusmuscarum*	1
Mosquitofish*	*Gambusia holbrooki*	1
Western Carp Gudgeon	*Hypseleotris klunzingeri*	1
Spangled Perch	*Leiopotherapon unicolor*	1
Murray Cod	*Maccullochella peelii peelii*	1,3
Golden Perch	*Macquaria ambigua*	1
Australian Smelt	*Retropinna semoni*	1
Freshwater Catfish	*Tandanus tandanus*	1
Amphibians		
Beeping Froglet	*Crinia parinsignifera*	1
Greenstripe Frog	*Cyclorana alboguttata*	1,2
Superb Collared Frog	*Cyclorana brevipes*	1
Eastern Snapping Frog	*Cyclorana novaehollandiae*	1,2
Barking Frog	*Limnodynastes fletcheri*	1
Salmon Striped Frog	*Limnodynastes salmini*	1,2
Spotted Grassfrog	*Limnodynastes tasmaniensis*	1,2
Scarlet Sided Pobblebonk	*Limnodynastes terraereginae*	1,2
Common Green Treefrog	*Litoria caerulea*	1,2
Broad Palmed Rocketfrog	*Litoria latopalmata*	1,2
Emerald Spotted Treefrog	*Litoria peronii*	1,2
Ruddy Treefrog	*Litoria rubella*	1,2
Ornate Burrowing Frog	*Opisthodon ornatus*	2
Cane Toad*	*Rhinella marina*	1,2
Dusky Gungan	*Uperoleia fusca*	1
Eastern Gungan	*Uperoleia laevigata*	2
Chubby Gungan	*Uperoleia rugosa*	1,2
Reptiles		
	Amphibolurus burnsi	1
Jacky Lizard	*Amphibolurus muricatus*	2
	Amphibolurus nobbi	1
	Anomalopus leuckartii	1,2
Five-clawed Worm Skink	*Anomalopus mackayi*	1,3
	Anomalopus verreauxii	1
Spotted Python	*Antaresia maculosa*	1
Stimson's Python#	*Antaresia stimsoni*	1
Woma	*Aspidites ramsayi*	1
Brown Tree Snake	*Boiga irregularis*	1,2
	Carlia foliorum	1,2
	Carlia mundivensis	1
	Carlia pectoralis	1,2
	Carlia schmeltzii	1

Common Name	*Scientific Name*	Record**
	Carlia vivax	1
Eastern Snake-necked Turtle	*Chelodina longicollis*	1
Ragged Snake-eyed Skink	*Cryptoblepharus pannosus*	1
Elegant Snake-eyed Skink	*Cryptoblepharus pulcher pulcher*	1
Striped Snake-eyed Skink	*Cryptoblepharus virgatus*	2
	Ctenotus robustus	1
Copper-tailed Skink	*Ctenotus taeniolatus*	1
Yellow-faced Whip Snake	*Demansia psammophis*	1,2
Common Tree Snake	*Dendrelaphis punctulata*	1
De Vis' Banded Snake	*Denisonia devisi*	1
Wood Gecko	*Diplodactylus vittatus*	1,2
	Egernia modesta	1
Yakka Skink	*Egernia rugosa*	1,3
Tree Skink	*Egernia striolata*	1
Broad-banded Sand Swimmer	*Eremiascincus richardsonii*	1
Red-naped Snake	*Furina diadema*	1
Dunmall's Snake	*Furina dunmalli*	3
	Gehyra dubia	1,2
Tree Dtella	*Gehyra variegata*	1
Grey Snake	*Hemiaspis damelii*	1
Bynoe's Gecko	*Heteronotia binoei*	1,2
Pale-headed Snake	*Hoplocephalus bitorquatus*	1
	Lerista fragilis	1
	Lerista muelleri	2
	Lerista punctatovittata	1,2
	Lerista sp.	1
	Lerista timida	1
Burton's Legless Lizard	*Lialis burtonis*	1
Steindachner's Gecko	*Lucasium steindachneri*	1,2
	Menetia greyii	1,2
	Menetia timlowi	1
Carpet Python	*Morelia spilota*	2
	Morethia boulengeri	1
	Morethia taeniopleura	1
	Nephrurus milii	1
	Oedura monilis	1
	Oedura robusta	1
Brigalow Scaly-foot	*Paradelma orientalis*	1,3
Bearded Dragon	*Pogona barbata*	1,2
	Pseudechis australis	1
Spotted Black Snake	*Pseudechis guttatus*	1
Red-Bellied Black Snake	*Pseudechis porphyriacus*	1
Eastern Brown Snake	*Pseudonaja textilis*	2
	Pygopus schraderi	1
	Ramphotyphlops affinis	1
	Ramphotyphlops proximus	1

Common Name	*Scientific Name*	Record**
	Ramphotyphlops wiedii	1
Fitzoy Turtle	*Rheodytes leukops*	3
	Cryptophis boschmai	1
Eastern Small-eyed Snake	*Cryptophis nigrescens*	1,2
Coral Snake	*Simoselaps australis*	1
Golden-tailed Gecko	*Strophurus taenicauda*	1,2,3
	Suta dwyeri	1
Curl Snake	*Suta suta*	1
Shingle-back	*Tiliqua rugosa*	1,2
Eastern Blue-tongued Lizard	*Tiliqua scincoides*	1
Freshwater Snake	*Tropidonophis mairii*	1
Grassland Earless Dragon	*Tympanocryptus pinguicolla*	3
Thick-tailed Gecko	*Underwoodisaurus millii*	2
Sand Monitor	*Varanus gouldii*	1,2
Yellow-spotted Monitor	*Varanus panoptes*	1,2
Lace Monitor	*Varanus varius*	1,2
Bandy-bandy	*Vermicella annulata*	1
Birds		
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	1,2
Inland Thornbill	*Acanthiza apicalis*	1
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	1,2
Striated Thornbill	*Acanthiza lineata*	2
Yellow Thornbill	*Acanthiza nana*	1,2
Brown Thornbill	*Acanthiza pusilla*	2
Buff-Rumped Thornbill	*Acanthiza reguloides*	1,2
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	1,2
Collared Sparrowhawk	*Accipiter cirrocephalus*	2
Brown Goshawk	*Accipiter fasciatus*	1,2
Clamorous Reed-warbler	*Acrocephalus australis*	2
Australian Owlet-nightjar	*Aegotheles cristatus*	1,2
Green Catbird	*Ailuroedus crassirostris*	1
Australian Brush-turkey	*Alectura lathami*	1,2
Australian King-parrot	*Alisterus scapularis*	2
Chestnut Teal	*Anas castanea*	1
Grey Teal	*Anas gracilis*	1,2
Garganey	*Anas querquedula*	1
Australasian Shoveler	*Anas rhynchotis*	1
Pacific Black Duck	*Anas superciliosa*	1,2
Darter	*Anhinga novaehollandiae*	1,2
Magpie Goose	*Anseranus semipalmata*	1,2,3
Regent Honeyeater	*Anthochaera phrygia*	3
Richard's Pipit	*Anthus novaeseelandiae*	1,2
Southern Whiteface	*Aphelocephala leucopsis*	1
Red-Winged Parrot	*Aprosmictus erythropterus*	1,2
Fork-Tailed Swift	*Apus pacificus*	1,2,3
Wedge-Tailed Eagle	*Aquila audax*	1,2

Common Name	*Scientific Name*	Record**
Great Egret	*Ardea alba*	1,3
Cattle Egret	*Ardea ibis*	1,2,3
Intermediate Egret	*Ardea intermedia*	1
Wandering Whistling-duck	*Dendrocygna arcuata*	1
White-necked Heron	*Ardea pacifica*	1,2
Australian Bustard	*Ardeotis australis*	1,2
Black-faced Woodswallow	*Artamus cinereus*	1
Dusky Woodswallow	*Artamus cyanopterus*	1
White-breasted Woodswallow	*Artamus leucorynchus*	1
Little Woodswallow	*Artamus minor*	2
Masked Woodswallow	*Artamus personatus*	1
White-browed Woodswallow	*Artamus superciliosus*	1
Hardhead	*Aythya australis*	2
Mallee Ringneck	*Barnardius zonarius barnardi*	2
Musk Duck	*Biziura lobata*	1
Bush Thick-knee	*Burhinus grallarius*	1
Sulphur-Crested Cockatoo	*Cacatua galerita*	2
Little Corella	*Cacatua sanguinea*	2
Fan-Tailed Cuckoo	*Cacomantis flabelliformis*	2
Pallid Cuckoo	*Cacomantis pallidus*	2
Brush Cuckoo	*Cacomantis variolosus*	2
Sharp-tailed Sandpiper	*Calidris acuminata*	1
Red-tailed Black-cockatoo	*Calyptorhynchus banksii*	1
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*	2
Glossy Black-cockatoo	*Calyptorhynchus lathami*	1,2
Pheasant Coucal	*Centropus phasianinus*	2
Horsfield's Bronze-cuckoo	*Chalcites basalis*	2
Shining Bronze-cuckoo	*Chalcites lucidus*	2
Gould's Bronze-cuckoo	*Chalcites minutillus russatus*	1
Black-eared Cuckoo	*Chalcites osculans*	2
Emerald Dove	*Chalcophaps indica*	1
Australian Wood Duck	*Chenonetta jubata*	2
Whiskered Tern	*Chlidonias hybrida*	2
Speckled Warbler	*Chthonicola sagittata*	2
Brown Songlark	*Cincloramphus cruralis*	1
Rufous Songlark	*Cincloramphus mathewsi*	2
Spotted Harrier	*Circus assimilis*	2
Golden-headed Cisticola	*Cisticola exilis*	1
Brown Treecreeper	*Climacteris picumnus*	2
Grey Shrike-thrush	*Colluricincla harmonica*	2
White-headed Pigeon	*Columba leucomela*	1
Domestic Pidgeon	*Columba livia*	2
Ground Cuckoo-Shrike	*Coracina maxima*	1
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	2
White-bellied Cuckoo-shrike	*Coracina papuensis*	2
	Coracina tenuirostris	1

Common Name	*Scientific Name*	Record**
White-winged Chough	*Corcorax melanorhamphos*	2
White-throated Treecreeper	*Cormobates leucophaea*	2
Little Crow	*Corvus bennetti*	1
Australian Raven	*Corvus coronoides*	1
Torresian Crow	*Corvus orru*	2
Stubble Quail	*Coturnix pectoralis*	1
Brown Quail	*Coturnix ypsilophora*	2
Pied Butcherbird	*Cracticus nigrogularis*	2
Australian Magpie	*Cracticus tibicen*	2
Grey Butcherbird	*Cracticus torquatus*	2
Banded Lapwing	*Cygnus atratus*	1
Laughing Kookaburra	*Dacelo novaeguineae*	2
Varied Sittella	*Daphoenositta chrysoptera*	2
Crested Pigeon	*Dendrocygna arcuata*	1
Plumed Whistling-Duck	*Dendrocygna eytoni*	2
Mistletoebird	*Dicaeum hirundinaceum*	2
Spangled Drongo	*Dicrurus bracteatus*	1
Emu	*Dromaius novaehollandiae*	2
Little Egret	*Egretta garzetta*	1
White-faced Heron	*Egretta novaehollandiae*	2
Black-shouldered Kite	*Elanus axillaris*	2
Letter-winged Kite	*Elanus scriptus*	1
Black-fronted Dotterel	*Elseyornis melanops*	2
Blue-faced Honeyeater	*Entomyzon cyanotis*	2
Galah	*Eolophus roseicapillus*	2
Eastern Yellow Robin	*Eopsaltria australis*	2
Black-necked Stork	*Ephippiorhynchus asiaticus*	1
Crimson Chat	*Epthianura tricolor*	1
Red Goshawk	*Erythrotriorchis radiatus*	1,3
Common Koel	*Eudynamys orientalis*	2
Spotted Nightjar	*Eurostopodus argus*	1
White-throated Nightjar	*Eurostopodus mystacalis*	2
Dollarbird	*Eurystomus orientalis*	2
Brown Falcon	*Falco berigora*	2
Nankeen Kestrel	*Falco cenchroides*	2
Australian Hobby	*Falco longipennis*	1
Peregrine Falcon	*Falco peregrinus*	1
Black Falcon	*Falco subniger*	1
Crested Shrike-tit	*Falcunculus frontatus*	1
Eurasian Coot	*Fulica atra*	2
Lathams Snipe	*Gallinago hardwickii*	1,3
Dusky Moorhen	*Gallinula tenebrosa*	1
Buff-banded Rail	*Gallirallus philippensis*	1
Diamond Dove	*Geopelia cuneata*	1
Bar-shouldered Dove	*Geopelia humeralis*	2
Peaceful Dove	*Geopelia striata*	2

Common Name	*Scientific Name*	Record**
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	1,3
White-throated Gerygone	*Gerygone albogularis*	2
Western Gerygone	*Gerygone fusca*	1
Little Lorikeet	*Glossopsitta pusilla*	2
Magpie-lark	*Grallina cyanoleuca*	2
Painted Honeyeater	*Grantiella picta*	1
Brolga	*Grus rubicunda*	1
White-bellied Sea Eagle	*Haliaeetus leucogaster*	1,3
Brahiminy Kite	*Haliastur indus*	1
Whistling Kite	*Haliastur sphenurus*	1
Black-breasted Buzzard	*Hamirostra melanosternon*	1
Little Eagle	*Hieraaetus morphnoides*	2
Black-winged Stilt	*Himantopus himantopus*	2
White-throated Needletail	*Hirundapus caudacutus*	2,3
Welcome Swallow	*Hirundo neoxena*	2
Comb-crested Jacana	*Irediparra gallinacea*	1
Varied Triller	*Lalage leucomela*	1
White-winged Triller	*Lalage sueurii*	1
Swift Parrot	*Lathamus discolor*	1,3
Wonga Pigeon	*Leucosarcia melanoleuca*	1
Yellow-faced Honeyeater	*Lichenostomus chrysops*	2
Fuscous Honeyeater	*Lichenostomus fuscus*	2
White-eared Honeyeater	*Lichenostomus leucotis*	2
Yellow-tufted Honeyeater	*Lichenostomus melanops*	1
White-plumed Honeyeater	*Lichenostomus penicillatus*	2
Singing Honeyeater	*Lichenostomus virescens*	1
Brown Honeyeater	*Lichmera indistincta*	2
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	1
Square-tailed Kite	*Lophoictinia isura*	1
Topknot Pigeon	*Lopholaimus antarcticus*	1
Brown Cuckoo-Dove	*Macropygia amboinensis*	1
Pink-Eared Duck	*Malacorhynchus membranaceus*	2
Superb Fairy-wren	*Malurus cyaneus*	2
Variegated Fairy-wren	*Malurus lamberti*	1
White-winged Fairy-wren	*Malurus leucopterus*	1
Red-Backed Fairy-Wren	*Malurus melanocephalus*	2
Splendid Fairy-wren	*Malurus splendens melanotis*	1
Yellow-throated Miner	*Manorina flavigula*	1
Noisy Miner	*Manorina melanocephala*	2
Tawny Grassbird	*Megalurus timoriensis*	1
Hooded Robin	*Melanodryas cucullata*	1
Lewin's Honeyeater	*Meliphaga lewinii*	1
White-Throated Honeyeater	*Melithreptus albogularis*	2
Brown-headed Honeyeater	*Melithreptus brevirostris*	1
Black-chinned Honeyeater	*Melithreptus gularis*	1
White-naped Honeyeater	*Melithreptus lunatus*	2

Common Name	*Scientific Name*	Record**
Rainbow Bee-eater	*Merops ornatus*	1,2,3
Little Pied Cormorant	*Microcarbo melanoleucos*	2
Jacky Winter	*Microeca fascinans*	2
Black Kite	*Milvus migrans*	1
Singing Bushlark	*Mirafra javanica*	2
Black-faced Monarch	*Monarcha melanopsis*	3
Satin Flycatcher	*Myiagra cyanoleuca*	1,3
Restless Flycatcher	*Myiagra inquieta*	2
Leaden Flycatcher	*Myiagra rubecula*	2
Scarlet Honeyeater	*Myzomela sanguinolenta*	1
Star Finch	*Neochima ruficauda ruficauda*	1,3
Plum-headed Finch	*Neochmia modesta*	1
Red-browed Finch	*Neochmia temporalis*	1
Turquoise Parrot	*Neophema pulchella*	1
Australian Cotton Pygmy-Goose	*Nettapus coromandelianus albipennis*	1,3
Barking Owl	*Ninox connivens*	2
Southern Boobook	*Ninox novaeseelandiae*	2
Blue Bonnet	*Northiella haematogaster*	1
Nankeen Night Heron	*Nycticorax caledonicus*	1
Cockatiel	*Nymphicus hollandicus*	2
Crested Pigeon	*Ocyphaps lophotes*	2
Crested Bellbird	*Oreoica gutturalis*	1
Olive-backed Oriole	*Oriolus sagittatus*	2
Blue-billed Duck	*Oxyura australis*	1
Golden Whistler	*Pachycephala pectoralis*	2
Rufous Whistler	*Pachycephala rufiventris*	2
Spotted Pardalote	*Pardalotus punctatus*	2
Striated Pardalote	*Pardalotus striatus*	2
House Swallow*	*Passer domesticus*	1
Plains-wanderer	*Pedionomus torquatus*	1,2,3
Australian Pelican	*Pelecanus conspicillatus*	2
Fairy Martin	*Petrochelidon ariel*	2
Red-Capped Robin	*Petroica goodenovii*	2
Rose Robin	*Petroica rosea*	1
Great Cormorant	*Phalacrocorax carbo*	2
Little Black Cormorant	*Phalacrocorax sulcirostris*	2
Pied Cormorant	*Phalacrocorax varius*	2
Common Bronzewing	*Phaps chalcoptera*	2
Little Friarbird	*Philemon citreogularis*	2
Noisy Friarbird	*Philemon corniculatus*	2
Yellow-billed Spoonbill	*Platalea flavipes*	2
Royal Spoonbill	*Platalea regia*	2
Pale-headed Rosella	*Platycercus adscitus*	2
Crimson Rosella	*Platycercus elegans*	1
Striped Honeyeater	*Plectorhyncha lanceolata*	2
Pacific Golden Plover #	*Pluvialis fulva*	1

Common Name	*Scientific Name*	Record**
Tawny Frogmouth	*Podargus strigoides*	2
Hoary-headed Grebe	*Poliocephalus poliocephalus*	2
Superb Parrot	*Polytelsi swainsonii*	3
White-browed Babbler	*Pomatostomus superciliosus*	1
Grey-Crowned Babbler	*Pomatostomus temporalis*	2
Purple Swamphen	*Porphyrio porphyrio*	2
Baillon's Crake	*Porzana pusilla*	1
Red-Rumped Parrot	*Psephotus haematonotus*	2
Paradise Parrot	*Psephotus pulcherrimus*	1,3
Psophodes olivaceus#	*Psophodes olivaceus*	1
Spotted Bowerbird	*Ptilonorhynchus maculatus*	2
Satin Bowerbird	*Ptilonorhynchus violaceus*	1
Grey Fantail	*Rhipidura albiscapa*	2
Willie Wagtail	*Rhipidura leucophrys*	2
Rufous Fantail	*Rhipidura rufifrons*	1,3
Australian Painted Snipe	*Rostratula australis*	1,3
Painted Snipe	*Rostratula benghalensis*	1,3
Channel-billed Cuckoo	*Scythrops novaehollandiae*	2
White-browed Scrubwren#	*Sericornis frontalis*	1
Regent Bowerbird#	*Sericulus chrysocephalus*	1
Weebill	*Smicrornis brevirostris*	2
Figbird	*Sphecotheres vieilloti*	2
Diamond Firetail#	*Stagonopleura guttata*	1
Freckled Duck	*Stictonetta naevosa*	1
Pied Currawong	*Strepera graculina*	2
Apostlebird	*Struthidea cinerea*	2
Common Starling*	*Sturnus vulgaris*	2
Australasian Grebe	*Tachybaptus novaehollandiae*	2
Double-barred Finch	*Taeniopygia bichenovii*	2
Zebra Finch	*Taeniopygia guttata*	1
Australian White Ibis	*Threskiornis molucca*	2
Straw-Necked Ibis	*Threskiornis spinicollis*	2
Forest Kingfisher	*Todiramphus macleayii*	1
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	1
Sacred Kingfisher	*Todiramphus sanctus*	1,2
Pale Yellow Robin#	*Tregellasia capito*	1
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	2
Rainbow Lorikeet	*Trichoglossus haematodus moluccanus*	2
Marsh Sanpiper	*Tringa stagnatilis*	1
Red-backed Button-Quail	*Turnix maculosus*	2
Black-breasted Button-Quail	*Turnix melanogaster*	2,3
Painted Button-Quail	*Turnix varia*	1
Little Button-Quail	*Turnix velox*	1
Masked Owl	*Tyto novaehollandiae novaehollandiae*	1
Masked Lapwing	*Vanellus miles novaehollandiae*	1,2
Banded Lapwing	*Vanellus tricolor*	1

Common Name	*Scientific Name*	Record**
Silvereye	*Zosterops lateralis*	1
Mammals		
Rufous Bettong	*Aepyprimus refescens*	1,2
Yellow-footed Antechinus	*Antechinus flavipes*	1
Dog*	*Canis familiaris*	1
Dingo	*Canis lupus dingo*	2
Goat*	*Capra hircus*	1
Large-eared Pied Bat	*Chalinolobus dwyeri*	1,3
Gould's Wattled Bat	*Chalinolobus gouldii*	2
Little Pied Bat	*Chalinolobus picatus*	2
Spotted-tailed Quoll	*Dasyurus maculatus maculatus*	3
Cat*	*Felis catus*	1
Bandicoot	*Isoodon sp.*	1
Brown Hare	*Lepus capensis*	1
Black-striped Wallaby	*Macropus dorsalis*	1
Eastern Grey Kangaroo	*Macropus giganteus*	2
Whiptail Wallaby	*Macropus parryi*	1
Common Wallaroo	*Macropus robustus*	1
Red-necked Wallaby	*Macropus rufogriseus*	2
Red Kangaroo	*Macropus rufus*	1
Beccari's Freetail Bat	*Mormopterus beccarii*	1
Eastern Freetail Bat	*Mormopterus sp. 2*	1
Inland Freetail Bat	*Mormopterus sp. 3*	2
House Mouse*	*Mus musculus*	1
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	2
Gould's Long-eared Bat	*Nyctophilus gouldi*	2
Eastern Long-eared Bat	*Nyctophilus timoriensis*	2,3
Rabbit*	*Oryctolagus cuniculus*	2
Greater Glider	*Petauroides volans*	2
Yellow-bellied Glider	*Petaurus australis*	2
Sugar Glider	*Petaurus breviceps*	2
Squirrel Glider	*Petaurus norfolcensis*	1
Koala	*Phascolarctos cinereus*	2
Narrow-nosed Planigale	*Planigale tenuirostris*	2
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	1
Eastern Pebble-mound Mouse	*Pseudomys patrius*	1
Black Flying-fox	*Pteropus alecto*	1
Grey-headed Flying-fox	*Pteropus poliocephalus*	3
Little Red Flying-fox	*Pteropus scapulatus*	2
Black Rat	*Rattus rattus*	1
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	2
Inland Broad-nosed Bat	*Scotorepens balstoni*	1
Little Broad-nosed Bat	*Scotorepens greyii*	2
Stripe-faced Dunnart	*Sminthopsis macroura*	2
Pig*	*Sus scrofa*	2
Short-beaked Echidna	*Tachyglossus aculeatus*	2

Common Name	*Scientific Name*	Record**
White-striped Freetail Bat	*Tadarida australis*	2
Troughton's Sheathtail Bat	*Taphozous troughtoni*	2
Common Brushtail Possum	*Trichosurus vulpecula*	2
Eastern Cave Bat	*Vespadelus troughtoni*	2
Little Forest Bat	*Vespadelus vulturnus*	2
Red Fox*	*Vulpes vulpes*	2
Swamp Wallaby	*Wallabia bicolor*	2

* Introduced species

** Record: 1 = Wildlife Online; 2 = Field Survey; 3 = EPBC Act Protected Matters Search; # = Species identified through database searches but highly unlikely to be found in the area.