



**UNIDEL**  
ENERGY AND INFRASTRUCTURE

# **QUEENSLAND CURTIS LNG PROJECT (PIPELINE COMPONENT)**

## **Supplementary Flora and Fauna Assessment**

**Doc. No. QG LNG-00-N-RP03**

0	Issued to Client	SM/RS	JC	JC	24 DEC 09
<b>Rev</b>	<b>Description</b>	<b>Originator</b>	<b>Reviewed</b>	<b>Approved</b>	<b>Date</b>

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>4</b>
<b>2</b>	<b>STUDIES PRESENTED IN THE DRAFT EIS.....</b>	<b>4</b>
<b>3</b>	<b>KEY DESIGN CHANGES .....</b>	<b>5</b>
	<b>3.1 Refinement of Proposed Pipeline alignments .....</b>	<b>5</b>
	3.1.1 Export Pipeline	6
	3.1.2 Collection Header	6
	3.1.3 Proposed Woleebee Creek Pipeline	7
	<b>3.2 Callide Gladstone Corridor .....</b>	<b>7</b>
	<b>3.3 Other developments in the region.....</b>	<b>7</b>
<b>4</b>	<b>ADDITIONAL STUDIES AND MONITORING .....</b>	<b>8</b>
	<b>4.1 Export Pipeline field assessment.....</b>	<b>8</b>
	<b>4.2 Callide Gladstone Corridor field assessment.....</b>	<b>8</b>
	<b>4.3 Assessment of Woleebee Creek alignment .....</b>	<b>9</b>
	<b>4.4 Review of the Queensland Herbarium Springs of Queensland dataset.....</b>	<b>9</b>
	<b>4.5 Review of Queensland Wetland mapping .....</b>	<b>9</b>
<b>5</b>	<b>EXISTING ENVIRONMENT .....</b>	<b>9</b>
	<b>5.1 Regional ecosystems/vegetation communities.....</b>	<b>9</b>
	5.1.1 Export Pipeline	9
	5.1.2 Woleebee Creek Pipeline	9
	<b>5.2 EVR flora .....</b>	<b>11</b>
	5.2.1 Export Pipeline	11
	5.2.2 Woleebee Creek Pipeline	11
	<b>5.3 EVR fauna and habitat values.....</b>	<b>11</b>
	5.3.1 Export Pipeline	11
	5.3.2 Woleebee Creek Pipeline	12
	<b>5.4 Aquatic ecology .....</b>	<b>12</b>
	5.4.1 Export Pipeline	12
	5.4.2 Woleebee Creek Pipeline	14
	5.4.3 Collection Header Pipeline	14
	<b>5.5 DERM Environmentally Sensitive Areas .....</b>	<b>14</b>
<b>6</b>	<b>POTENTIAL IMPACTS .....</b>	<b>15</b>
	<b>6.1 Clearing of ecological communities/regional ecosystems .....</b>	<b>15</b>
	<b>6.2 EVR flora .....</b>	<b>16</b>
	<b>6.3 EVR fauna and habitat values.....</b>	<b>17</b>
	<b>6.4 Aquatic ecology .....</b>	<b>17</b>
	<b>6.5 DERM Environmentally Sensitive Areas .....</b>	<b>17</b>
	<b>6.6 Cumulative impacts.....</b>	<b>18</b>
<b>7</b>	<b>MITIGATION AND REHABILITATION RECOMMENDATIONS.....</b>	<b>19</b>
<b>8</b>	<b>DETAILED RESPONSE TO SUBMISSIONS .....</b>	<b>20</b>

8.1	DERM Submission (Submitter Number 32).....	20
8.2	Callide Valley Landcare Group (Submitter Number 1) .....	28
8.3	PCCC submission (Submitter Number 23) .....	29
8.4	Fitzroy Basin Association (Submitter Number 25).....	30
8.5	Upper Dawson Branch WPSQ (Submitter Number 34) .....	30
9	REFERENCES.....	31
	APPENDIX 1 – CURRICULA VITAE .....	32

## 1 INTRODUCTION

QGC Limited, a wholly-owned subsidiary of the BG 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.

QGC was required to submit an Environmental Impact Statement (EIS) to meet the requirements of being nominated as a significant project under the Queensland Government's *State Development and Public Works Organisation Act 1971 (SDPWO Act)*. Furthermore, the EIS was also required to address Matters of National Environmental Significance (MNES) under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The draft EIS for the Queensland Curtis LNG Project was released to the public and was available for public comment on the 28<sup>th</sup> of August 2009.

QGC has also been required by both the Australian and the Queensland Government to submit a supplementary EIS. The purpose of the supplementary EIS is to address the submissions that have arisen throughout the commentary process, provide further information about the project and identify and discuss Project design changes that have occurred since the release of the EIS.

In addition to addressing relevant submissions, this report will provide details of the additional studies and surveys that have been undertaken to supplement the Pipeline Terrestrial and Freshwater Flora and Fauna Assessment presented in *Appendix 4.2* of the QC LNG draft EIS ('the draft EIS').

More specifically, this report will include:

- The findings of the detailed flora and fauna assessments that were undertaken along the current Export Pipeline alignment
- The findings of the flora and fauna surveys that were undertaken along the Callide Gladstone Corridor
- A desktop analysis of the environmental values present along the Woleebee Creek Pipeline alignment
- The findings of a study conducted to determine the proximity of the Project in relation to all Great Artesian Basin Springs located within the Surat Basin
- Potential cumulative impacts on environmental values as a result of this development and other development within the region.

It is expected that the findings of this report will be presented in the supplementary EIS.

## 2 STUDIES PRESENTED IN THE DRAFT EIS

The flora and fauna assessments that were undertaken for and included within the draft EIS considered publically available databases and published information. These desktop studies were supplemented with a rapid flora and fauna assessment of the Option 1 Export Pipeline route and the Collection Header corridor.

The draft EIS considered the potential for and the known occurrences of protected plants, animals and vegetation communities listed under the *EPBC Act*, the Queensland



*Nature Conservation Act 1992 (NC Act)* and the *Queensland Vegetation Management Act 1999 (VM Act)*. This study also considered Regionally Significant Species and areas of Special Biodiversity Value as identified in the Queensland Department of Environment and Resource Management (DERM) Biodiversity Planning Assessment for the Brigalow Belt Bioregion. DERM Environmentally Sensitive Areas and general biodiversity values, evaluated in terms of common flora and fauna and habitat corridors, were also mapped and described.

The flora field surveys were undertaken by botanists over a total period of 30 days. The flora surveys involved the ground truthing of 184 sites. Of these, 66 sites were assessed to the tertiary level and the remaining 118 to a quaternary level. These flora site surveys were conducted in accordance with Queensland Herbarium survey methods described in Nelder *et al.* (2005).

The fauna surveys initially involved a rapid assessment of the fauna habitat conducted in conjunction with the flora surveys. Then detailed fauna surveys were undertaken within the proximity of the Collection Header corridor by ecologists over a total period of 18 days. Detailed fauna surveys were conducted using pit fall traps, bat traps, ultrasonic bat recording, remote cameras, observational bird transects and night spotlighting. The detailed fauna surveys were undertaken within representative areas of intact native vegetation as it is assumed that such areas would provide the best indication of fauna abundance and diversity (Pennay *et al.* 2002).

The results of these desktop and field studies, a discussion of the potential impacts that may arise from the Project and recommended mitigation measures were presented in a technical flora and fauna report included in the draft EIS.

This report only considers changes to the Project design, recent studies and findings that are additional to those presented in the draft EIS. Therefore it can be assumed that any subject area and/or details that are not provided for in this report remain the same with those that were presented in the draft EIS.

### **3 KEY DESIGN CHANGES**

#### **3.1 Refinement of Proposed Pipeline alignments**

Since the release of the draft EIS refinements to the project design have lead to changes to the route and length of the Export Pipeline and the Collection Header. Furthermore, the Lateral Pipeline has been removed and the Woleebee Creek Pipeline has been added to the scope of the Project design. The Lateral Pipeline will not be considered for the purpose of the supplementary EIS.

A comparison of which pipelines/pipeline revisions that were used for the purpose of the ecology studies presented in the draft EIS as opposed to what has been used for the ecology studies presented in the supplementary EIS are presented in *Table 1*. The pipelines / pipeline revisions that have been considered for the purposes of the studies presented in this report are shown in *Figure 1*.



**Table 1: Comparison of proposed pipelines, lengths and corridor widths used to calculate clearing areas presented in the draft EIS and the supplementary EIS**

Proposed pipeline	draft EIS			Supplementary EIS		
	Revision date	Length (km)	Corridor width (m)	Revision date	Length (km)	Corridor width (m)
Export Pipeline	5 <sup>th</sup> December 2008	380	50	1 <sup>st</sup> December 2009	388	50
Collection Header	26 <sup>th</sup> November 2008	220	100	1 <sup>st</sup> December 2009	170	135 (KP 0-35) 90 (KP 35-100) 50 (KP 100-170)
Lateral Pipeline	17 <sup>th</sup> November 2008	152	50	Not included		
Woleebee Creek Pipeline	Not included			1 <sup>st</sup> December 2009	55	135 (KP 0-20) 50 (KP 20-55)

### 3.1.1 Export Pipeline

Refinements to the Export Pipeline route has lead to the retainment of Option 2 Export Pipeline and the removal of Option 1 Export Pipeline. The Option 2 Export Pipeline alignment presented in the draft EIS will be the only Export Pipeline route considered for the purposes of the supplementary EIS.

As the Project progresses it is expected that the Export Pipeline alignment will be subject to further refinements prior to construction. For the purposes of this study, the Export Pipeline alignment revision dated the 1<sup>st</sup> December 2009 has been used. The average width of the Right of Way (ROW) for this pipeline is 40 m. Note that the corridor width may decrease through areas of significant vegetation/watercourses and increase at truck turn-around locations. To account for any variations in the ROW width, a worst case clearing corridor of 50 m has been used to calculate the extent of clearing.

### 3.1.2 Collection Header

Due to land access constraints and continual refinements to this alignment, to date, no detailed flora and fauna surveys have been taken along the proposed Collection Header route. It is expected that detailed assessments of the Collection Header alignment will be undertaken throughout the route finalisation process and prior to the commencement of construction activities.

This study has considered the Collection Header alignment revision dated the 1<sup>st</sup> December 2009. The average width of the Collection Header ROW is 125 m for 35 km, 80 m for 65 km and 40 m for 70 km. To account for any variation in the average ROW width the clearing corridors for the purpose of this assessment have been taken to be 135 m for 35 km, 90 m for 65 km and 50 m for 70 km.

### 3.1.3 Proposed Woleebee Creek Pipeline

The Woleebee Creek Pipeline route branches off the Export Pipeline at approximately KP 45 and runs west for approximately 50 km.

For this study, the Woleebee Creek Pipeline alignment considered is dated the 1<sup>st</sup> December 2009. Note that the average width of the Woleebee Creek Pipeline ROW is 125 m for 20 km and 40 m for 35 km. To account for any variation in the ROW width the clearing corridors have been taken to be 135 m for 20 km and 50 m for 35 km.

### 3.2 Callide Gladstone Corridor

QGC has been negotiating with the Department of Infrastructure and Planning (DIP) in relation to the co-location of infrastructure within the Callide Gladstone Corridor (CGC). This corridor is located within the northern portion of the Export Pipeline before it crosses over the Narrows to Curtis Island.

The width of the CGC is expected to be somewhere in the order of 100 m. However, for the purpose of assessing potential clearing areas required for this project, this study will consider a corridor width of approximately 50 m. This width is considered to be appropriate as this would be the corridor width required if QGC were not to locate infrastructure within the CGC. This is considered to be a conservative approach, for taking into account the width of the corridor and the amount of infrastructure to be sited within it, QGC's area of impact is likely to be significantly less than 50 m.

The CGC alignment dated the 1<sup>st</sup> of December was used for the studies presented in this report.

### 3.3 Other developments in the region

The draft EIS identified and discussed potential cumulative impacts on flora and fauna that may result from the QCLNG Project and other existing, known or proposed projects located within the vicinity of the pipelines. An additional project that was not considered in the draft EIS, and which information was publicly available is the Surat Gladstone Project Pipeline. A comparison of the proposed projects considered in the draft EIS as opposed to what has been considered in the supplementary EIS is presented in *Table 2*.

**Table 2: Comparison of proposed projects considered in the EIS and the supplementary EIS**

Proposed projects	Presented in the EIS	Presented in the sEIS
Other QGC Tenements (excluding Sunshine Gas)	X	X
Condamine Power Station	X	X
Spring Valley Power Station	X	X
New Acland Coal Mine Stage 3	X	X
Wondoan Coal Project	X	X
Felton Mine and Pilot Plant	X	X
Linc Energy Underground Coal Gasification	X	X
Kunioon Open Cut Mine	X	X
Nathan Dam and Pipelines	X	X
Gladstone LNG Project	X	X
Surat Gladstone Pipeline		X



The Surat Gladstone Pipeline Project originates in the Surat Basin. It runs parallel to the southern portion of the Collection Header and the Export Pipeline before crossing the Narrows over to Curtis Island (*Figure 2*).

For a discussion of the cumulative impacts on environmental values that may arise as a result of the QCLNG Pipelines and the Surat Gladstone Pipeline Project refer to *Section 6.6*.

## 4 ADDITIONAL STUDIES AND MONITORING

Additional studies and field surveys that have been undertaken since the release of the draft EIS include:

- A walk through survey of the proposed Export Pipeline route
- Field surveys of all vegetated creek crossings traversed by the Callide Gladstone Corridor
- Desktop analysis of environmental values present along the Woleebee Creek Pipeline corridor
- Review of Queensland Wetland mapping
- Review of the Queensland Herbarium Springs of QLD Dataset.

### 4.1 Export Pipeline field assessment

A walk through survey between approximate KPs 0 and 300 of the Export Pipeline was undertaken over a total of 15 days in September-November 2009 by Unidel Senior Botanist Wayne Harris (CV provided for in *Attachment 1*).

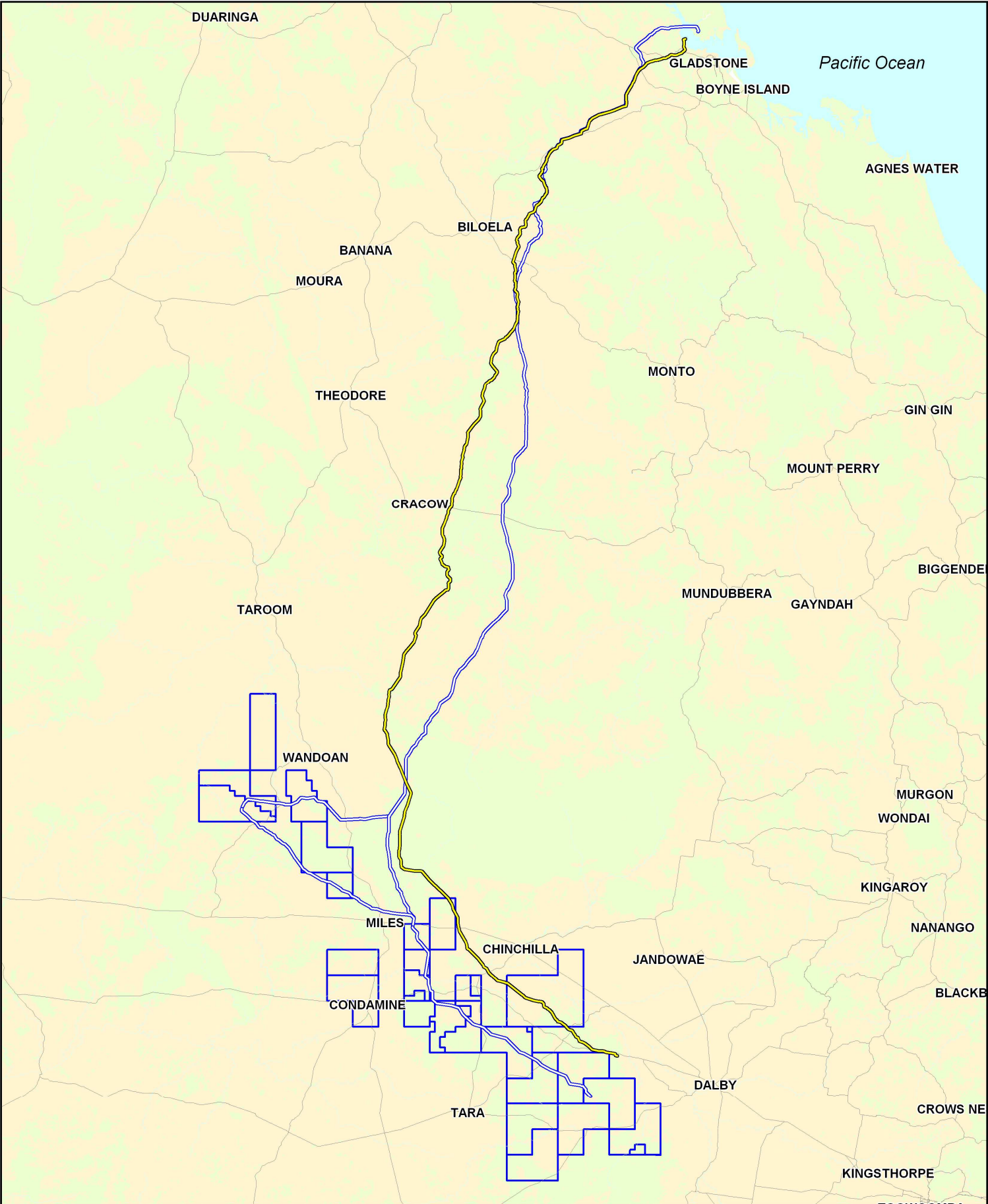
This field survey involved ground truthing key REs and targeted searches for EVR<sup>1</sup> flora species along the alignment. Coordinates of all observed EVR flora species were recorded and the alignment was modified where possible to avoid significant habitat features.

### 4.2 Callide Gladstone Corridor field assessment

Unidel, representing QGC, was involved in the flora and fauna survey of the proposed extension of the CGC. A flora and fauna survey was conducted between approximate KPs 311-350 of the Export Pipeline on the 7-8th of September 2009 by Unidel Senior Botanist Wayne Harris and Principal Ecologist Bruce Thomson (CVs provided for in *Attachment 1*).

The purpose of this survey was to assess the condition and flora/fauna values of riparian vegetation along watercourses that may be traversed by the CGC. This survey also confirmed the presence and condition of some areas mapped as significant regrowth under the *VM Act*. The locations of the sites that were assessed are shown in *Figure 3*.

<sup>1</sup> 'EVR' has been used to describe all species listed under the *EPBC Act* as extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent and *NC Act* as extinct in the wild, endangered, vulnerable, rare and near threatened.



**CLIENT:** Queensland Gas Company

**PROJECT:** Queensland Curtis LNG Project

**TITLE:** Figure 2.

**DATE:** 03-December-2009

**DATA SOURCE:**

1:250,000 Topographic Raster copyright Geoscience Australia

Mining Tenement Information copyright State of Queensland (Dept. Mines and Energy)

**SCALE:** 1:1,000,000 (A3) GDA94 Lat/Long

-20 -10 0 10 20 30 40

Kilometres

**LEGEND**

- Surat to Gladstone Pipeline Project
- Queensland Curtis LNG Project
- QLD TOPO250K\_WATERCOURSELINE
- QLD TOPO250K\_ROADS

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

**QCC**

A BG Group business

GPO Box 3107 - Brisbane QLD 4001

p (07) 3024 9000 f (07) 3024 8999

w <http://www.qgc.com.au> e [qgc@qgc.com.au](mailto:qgc@qgc.com.au)

**UNIDEL**

LAND AND SURVEYING

**AREA OF DETAIL**

WORKSPACE: G:\QCC\QCLNG\CurWork\Represent\WB\_QCC\_00607  
MAP: G:\QCC\QCLNG\CurWork\Represent\WB\_QCC\_00607

Unidel Group Pty Ltd does not guarantee the accuracy or completeness of the map and does not make any warranty about the data.  
Unidel Group Pty Ltd is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map.



**CLIENT:** Queensland Gas Company

**PROJECT:** Queensland Curtis LNG Project

**TITLE:** Figure 3.

**DATE:** 03-December-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

**SCALE:** 1:250,000 (A3) GDA94 Lat/Long



## LEGEND

Export Pipeline RevEIS 20091201

 Fauna Habitat Survey Points

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION



QGC  
ABC Group business

A BG Group business  
GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
w <http://www.qgc.com.au> e [qgc@qgc.com.au](mailto:qgc@qgc.com.au)



## AREA OF DETAIL





### 4.3 Assessment of Woleebee Creek alignment

As a result of land access constraints and continual refinements to the Woleebee Creek Pipeline alignment, to date the assessment of this proposed pipeline has been limited to a desktop assessment. A detailed survey of this alignment is expected to take place prior to alignment finalisation and commencement of the Project.

### 4.4 Review of the Queensland Herbarium Springs of Queensland dataset

The Queensland Herbarium Springs of Queensland – Distribution and Assessment (Version 4.0) was reviewed in order to determine whether any natural springs occur within or in the close vicinity of the Project study area.

In particular, this study focussed on any possible occurrences of the *EPBC Act* listed threatened ecological community 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin' which is known to occur within the Surat North and Surat Management Areas of the Great Artesian Basin (GAB).

### 4.5 Review of Queensland Wetland mapping

In addition to Wetlands of International importance (Ramsar wetlands) and Wetlands of National Significance (Directory of Important Wetlands) that were reviewed for the draft EIS, the Queensland Wetlands Mapping (DERM, Version 2.0, September 2009) was assessed to identify any water bodies and wetlands regional ecosystems that occur within or in close proximity to the proposed pipeline corridors.

## 5 EXISTING ENVIRONMENT

### 5.1 Regional ecosystems/vegetation communities

#### 5.1.1 Export Pipeline

The flora walk through survey of the Export Pipeline alignment (between KP 0-300) confirmed that the majority of the areas that are to be traversed by the proposed Export Pipeline alignment are cleared grazing properties. Ground truthing of areas mapped as endangered or of concern by the Queensland Herbarium, confirmed that these areas were generally all as mapped.

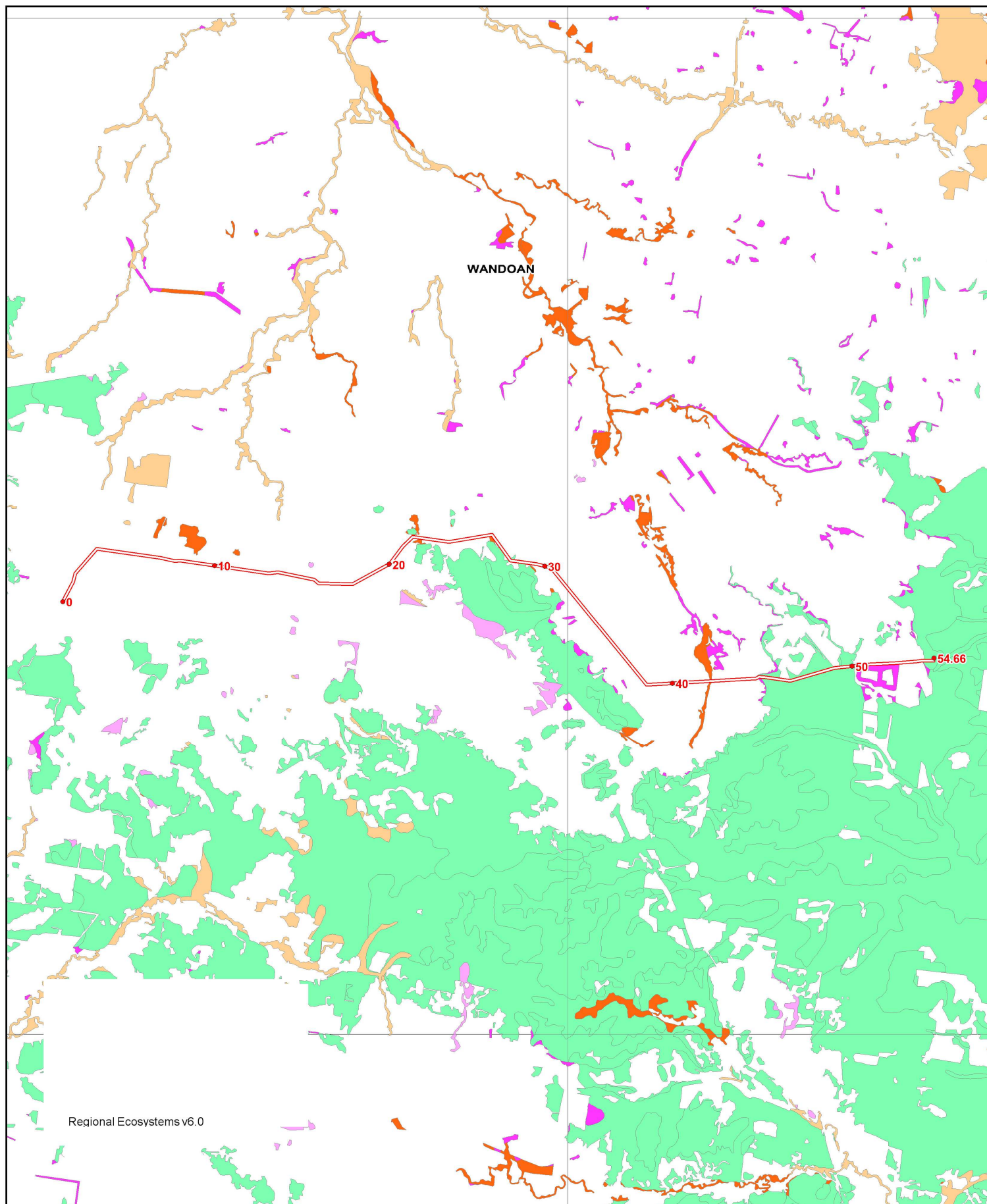
The field surveys undertaken within the proposed CGC route found the area to be heavily grazed with few patches of remnant vegetation remaining. Several weed species such as *Camara lantana* (Lantana) and *Cryptostegia grandiflora* (Rubber Vine) were observed. Remnant vegetation observed was generally restricted to ephemeral watercourses and consisted mostly of eucalypt dominated canopy with *Callistemon viminalis* common in the shrub layer. Overall, the condition of the vegetation that was observed along the CGC was in an average condition.

#### 5.1.2 Woleebee Creek Pipeline

A review of the Queensland Herbarium mapping identified nine REs as transected by the Woleebee Creek pipeline route (*Figure 4*).

The proposed pipeline alignment has been designed to minimise impacts on areas mapped as remnant vegetation, in particular any areas listed under the *EPBC Act* and/or endangered or of concern under the *VM Act*. The majority of the remnants that cannot be avoided occur on the eastern portion of the alignment between KPs 44.5 and 50, and





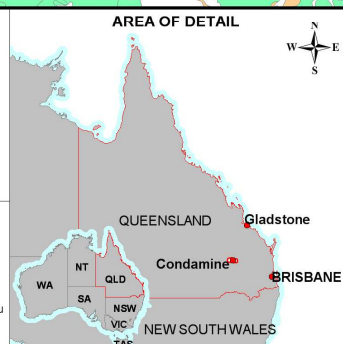
DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

QGC

A BG Group business  
GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
w <http://www.ggc.com.au> e [ggc@ggc.com.au](mailto:ggc@ggc.com.au)



## UNIDE



KPs 53.8 and 54.6. These remnants are made up of REs listed as not of concern under the *VM Act*.

The proposed pipeline crosses one thin linear strip of RE 11.3.2 (of concern classification) at KP 42.1

A full list of all REs that occur along the proposed Woleebee Creek pipeline route is provided in *Table 3*.

**Table 3: REs Mapped Along the Woleebee Creek Pipeline Route**

Ecological community / REs	Description	VM Act Status	EPBC Act Status	Area (ha)
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC*	-	0.41
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	NOC**	-	0.07
11.5.1	<i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>Angophora luehmannii</i> woodland on Cainozoic sand plains/remnant surfaces	NOC	-	1.20
11.5.4	<i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>C. endlicheri</i> , <i>E. chloroclada</i> , <i>Angophora leiocarpa</i> on Cainozoic sand plains/remnant surfaces. Deep sands.	NOC	-	4.92
11.5.21	<i>Corymbia bloxsomei</i> +/- <i>Callitris glaucophylla</i> +/- <i>Eucalyptus crebra</i> +/- <i>Angophora leiocarpa</i> woodland on Cainozoic sand plains/remnant surfaces	NOC	-	9.83
11.7.2	<i>Acacia</i> spp. Woodland on Cainozoic lateritic duricrust. Scrap retreat zone	NOC	-	2.65
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on Cainozoic lateritic duricrust	NOC	-	9.83
11.7.6	<i>Corymbia citriodora</i> or <i>Eucalyptus crebra</i> woodland on Cainozoic lateritic duricrust	NOC	-	0.51
11.7.7	<i>Eucalyptus fibrosa</i> subsp. <i>Nubila</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus</i> spp. On Cainozoic lateritic duricrust	NOC	-	2.37

OC = Of Concern under the *VM Act*; NOC = Not of Concern under the *VM Act*

No essential habitat areas or environmentally sensitive areas are mapped as occurring within or in close proximity to the proposed Woleebee Creek Pipeline route.

## 5.2 EVR flora

### 5.2.1 Export Pipeline

The only EVR flora species that was recorded during additional studies is the species *Cycas megacarpa* (Large-fruited Zamia) listed as endangered under both the *EPBC Act* and the *NC Act*.

Approximately 150 individuals of this species were recorded within the Export Pipeline corridor across three locations. The approximate locations of these populations are KP 297, 305 and 310 (See *Figure 5*). GIS coordinates have been recorded for all individuals/groups within the corridor footprint and have been mapped along the Export Pipeline in *Figures 6-8*.

Note that the Export Pipeline has been subject to slight realignments since the detailed flora surveys were undertaken. Therefore, as can be seen in *Figure 6*, the recorded *Cycas megacarpa* locations at one location don't correlate with current Export Pipeline route. Prior to the route finalisation and commencement of construction activities detailed flora surveys will be undertaken to determine the exact number of *Cycas megacarpa* that occur within, and potentially could be affected by the Export Pipeline construction.

No EVR flora species were recorded during the flora surveys conducted along the proposed extension of the CGC.

### 5.2.2 Woleebee Creek Pipeline

No EVR flora species are mapped as occurring within or in close vicinity of the Woleebee Creek Pipeline route.

Detailed flora studies, which will detect the presence of any EVR species flora, will be undertaken prior to alignment finalisation and the commencement of construction activities.

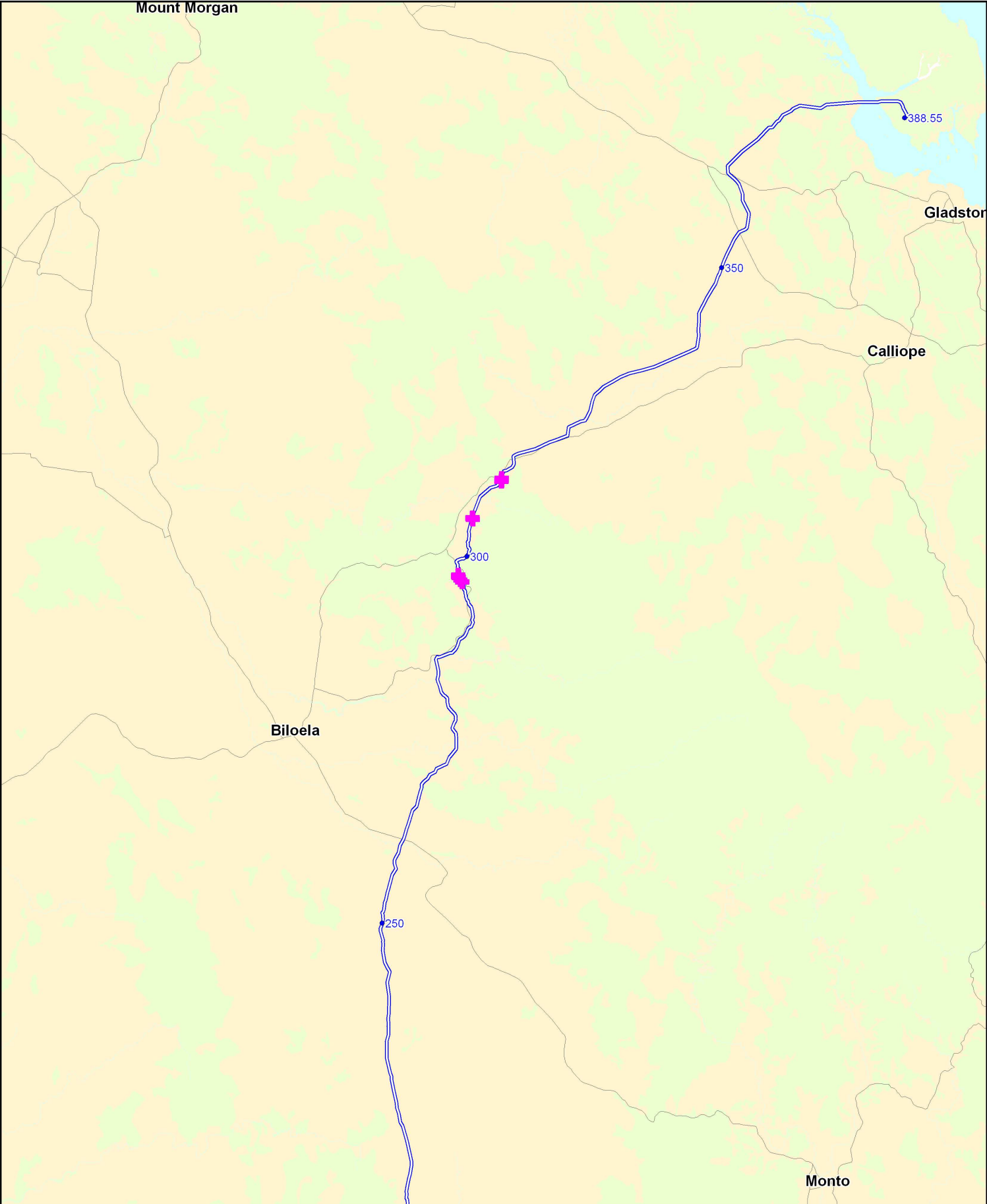
## 5.3 EVR fauna and habitat values

### 5.3.1 Export Pipeline

Field surveys of the proposed extension of the CGC (i.e. KP 311-350 of the Export Pipeline) found the area to be heavily grazed with few patches of remnant vegetation remaining. Several weed species such as *Camara lantana* (Lantana) and *Cryptostegia grandiflora* (Rubber Vine) were observed.

The remnant vegetation observed was generally restricted to ephemeral watercourses and consisted mostly of eucalypt dominated canopy with *Callistemon viminalis* common in the shrub layer. Several large eucalypt trees with hollows and logs and branches on the ground were recorded. These trees and vegetation debris could provide habitat for a number of fauna species. Overall, the condition of the vegetation that was observed was average.

The EVR fauna species *Geophaps scripta scripta* (Squatter Pigeon) was recorded at approximate KP 322 along a dry watercourse. This species is listed as Vulnerable under both the *EPBC Act* and the *NC Act*.



CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 5.

DATE: 03-December-2009

DATA SOURCE:  
1:250,000 Topographic Raster copyright Geoscience Australia

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20-100203040

Kilometres

LEGEND

+

Cycads flora survey points

Export Pipeline RevEIS 20091201

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

QCC

A BG Group business

GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
w <http://www.qgc.com.au> e [qgc@qgc.com.au](mailto:qgc@qgc.com.au)

UNIDEL

UNITED NATURE INVESTMENTS

AREA OF DETAIL

N  
W  
E  
S

QUEENSLAND

WA NT QLD SA NSW VIC TAS

Condamine Gladstone

BRISBANE

NEW SOUTH WALES

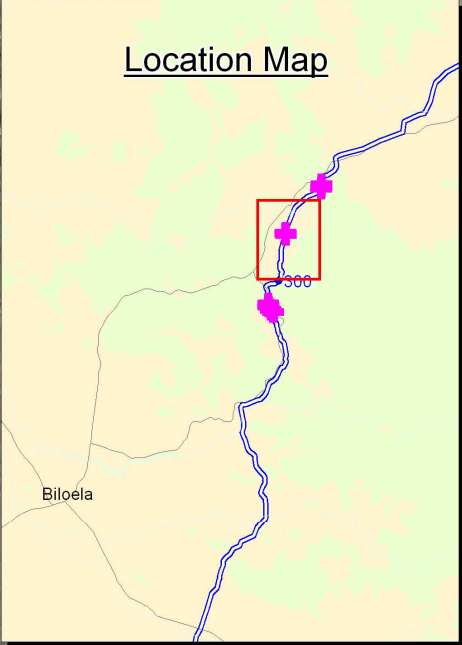
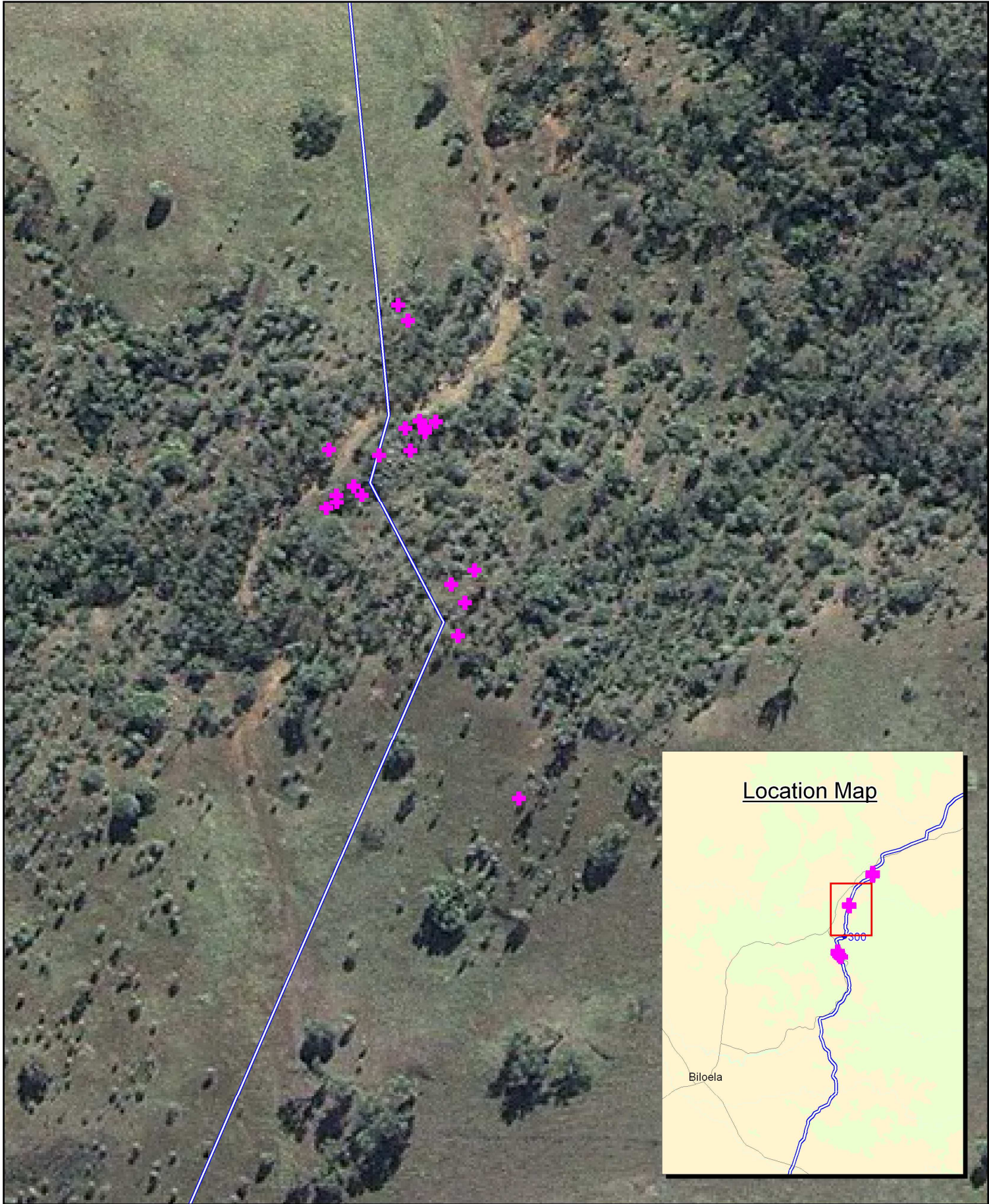
WORKSPACE: G:\GOC\QCLUG\Data\Work Request\WB\_CGC\_00807  
MAP: G:\GOC\QCLUG\Data\Work Request\WB\_CGC\_00807




Unidel Group Pty Ltd does not guarantee the accuracy or completeness of the map and does not make any warranty about the data.  
Unidel Group Pty Ltd is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map.









<b>CLIENT:</b> Queensland Gas Company	<b>LEGEND</b>  + Cycads flora survey points  — Export Pipeline RevEIS 20091201	<table border="1"><thead><tr><th>DATE</th><th>DRAWN</th><th>APPROVED</th><th>DRAWING NO.</th><th>REVISION</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></tbody></table>	DATE	DRAWN	APPROVED	DRAWING NO.	REVISION																				
DATE			DRAWN	APPROVED	DRAWING NO.	REVISION																					
<b>PROJECT:</b> Queensland Curtis LNG Project																											
<b>TITLE:</b> Figure 7.																											
<b>DATE:</b> 03-December-2009																											
<b>DATA SOURCE:</b> 1:250,000 Topographic Raster copyright Geoscience Australia Spot10 imagery copyright SPOT Image Corporation 2007																											
<b>SCALE:</b> 1:1500 (A3) GDA94 Lat/Long -30 -15 0 15 30 45 60 Metres	 A BG Group business GPO Box 3107 - Brisbane QLD 4001 p (07) 3024 9000 f (07) 3024 8999 w <a href="http://www.qgc.com.au">http://www.qgc.com.au</a> e <a href="mailto:qgc@qgc.com.au">qgc@qgc.com.au</a> 	<b>AREA OF DETAIL</b>  QUEENSLAND Gladstone Condamine BRISBANE WA NT QLD SA NSW VIC TAS NEW SOUTH WALES																									





### 5.3.2 Woleebee Creek Pipeline

No EVR fauna species are mapped as occurring within or in close vicinity of the Woleebee Creek Pipeline route.

Detailed surveys, which will record habitat values and identify the potential for EVR fauna to utilise this habitat will be conducted prior to alignment finalisation and the commencement of construction activities.

## 5.4 Aquatic ecology

Review of the Distribution and Assessment of the Queensland Herbarium Springs of Queensland Dataset indicate that no *EPBC Act* listed communities of 'Native species dependent on the Great Artesian Basin' are in the proximity of, or will be affected by the proposed pipeline corridors (See *Figure 9*).

The following section discusses the wetland values present along each of the pipeline corridors that was identified upon review of the Queensland Wetland Mapping Dataset.

### 5.4.1 Export Pipeline

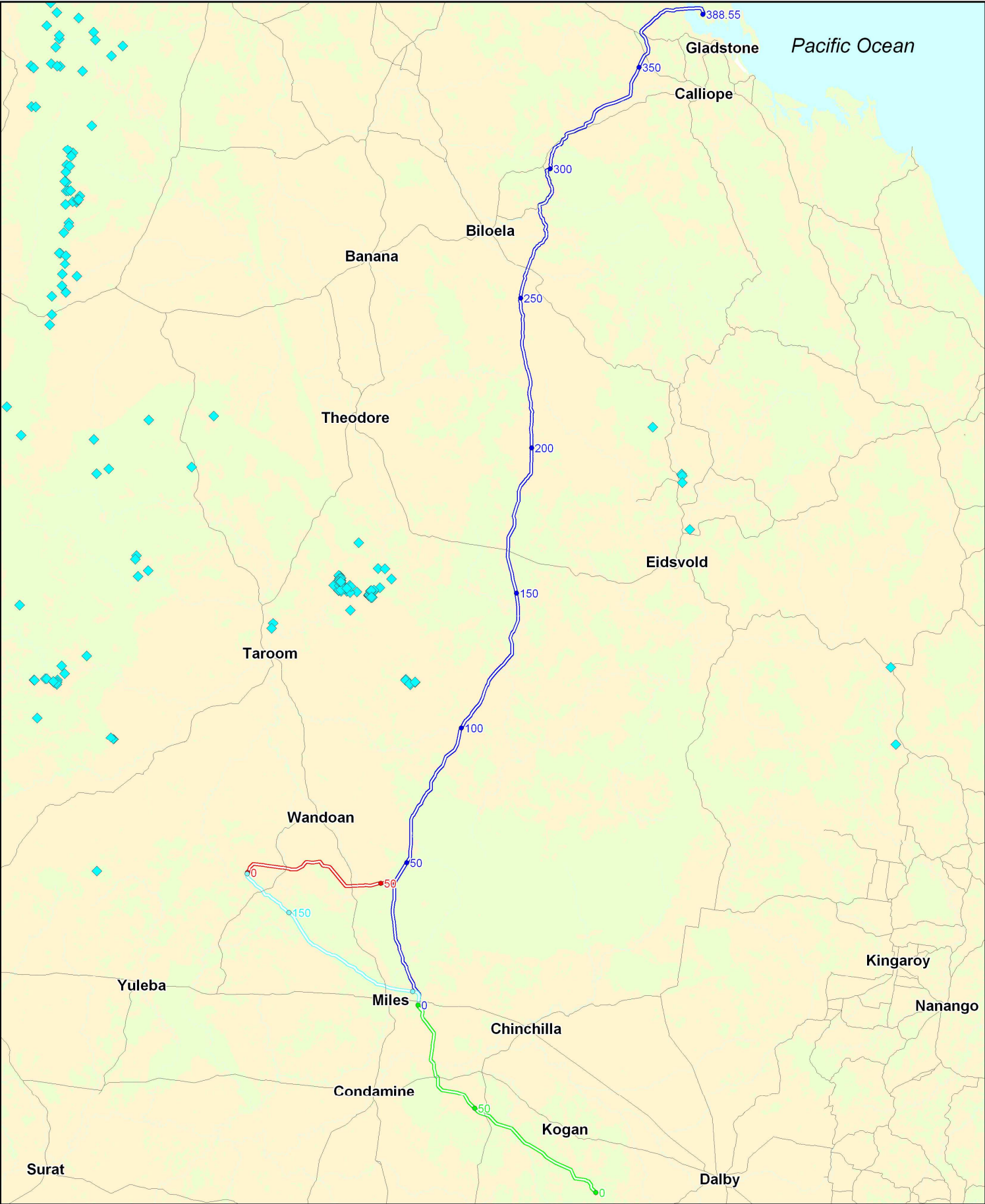
Several water bodies and wetlands REs were found to occur within 500 m of the Export Pipeline (*Table 4*). The majority of these are artificial wetlands such as dams and/or ringtanks, the remaining are lucustrine wetlands riverine or fringing riverine wetlands which are made up of the REs 11.3.27b, 11.3.27f, and 11.3.25 (*Figures 10-12*). The Export Pipeline corridor traverses wetlands at four locations, these being fringing riverine wetland RE 11.3.25 (i.e. KPs 217.5, 290, 291 and 291.5). At all of these locations the "wetland" is a commonly dry ephemeral watercourse.

Subsequent to the publication of the draft EIS, the pipeline route has been inspected on foot and the nature and quality of wetlands and wetland REs were noted. In most cases, the pipeline has been aligned to avoid habitats containing wetlands and riverine areas. However, where this was not possible, it was noted that they consisted of narrow, ephemeral streams and small depressions which may hold water for a short period after heavy rain events.

**Table 4: Wetlands mapped as occurring within 500 m of the Export Pipeline**

KP	Distance from Pipeline	Upstream / Downstream	Wetland - REs	Comment
13.1	85 m	Upstream	Artificial wetland – dams, ringtanks – RE 11.3.27b	
57.8	480 m	Downstream	Artificial wetland – dams, ringtanks	
80.5	115 m	Upstream	Artificial wetland – dams, ringtanks	
84.8	380 m	Downstream	Artificial wetland – dams, ringtanks	
217.5	Intersects		11.3.25 - riverine	Commonly dry ephemeral watercourse
221.3	400 m	Downstream	Artificial wetland – dams,	





CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 9.

DATE: 03-December-2009

DATA SOURCE:  
1:250,000 Topographic Raster copyright Geoscience Australia

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20-1003040

Kilometres

LEGEND

Great Artesian Basin Springs

Water Collection Header RevEIS 20091201

Export Pipeline RevEIS 20091201

Woleebee Creek Option RevEIS 20091201

Upstream Infrastructure Corridor RevEIS 20091201

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

QCC

A BG Group business

GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
w <http://www.qgc.com.au> e [qgc@qgc.com.au](mailto:qgc@qgc.com.au)

UNIDEL

UNITED NATIONS DEVELOPMENT PROGRAM

AREA OF DETAIL

N

E

S

W

QUEENSLAND

NT

QLD

SA

NSW

VIC

TAS

Gladstone

Condamine

BRISBANE

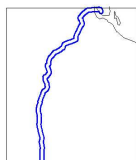
WA

NEW SOUTH WALES

WORKSPACE: G:\GEOC\QCLNG\Cart\Work Request\WB\_CGC\_00607  
MAP: G:\GEOC\QCLNG\Cart\Work Request\WB\_CGC\_00607

Unidel Group Pty Ltd does not guarantee the accuracy or completeness of the map and does not make any warranty about the data.  
Unidel Group Pty Ltd is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map.

# Main Map Location



Pacific Ocean

Gladstone

Tannum Sands

Calliope

Biloela

Monto

## Wetlands 100K Legend

- Estuarine
- Lacustrine
- Marine
- Palustrine
- Riverine

CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 10.

DATE: 03-December-2009

### DATA SOURCE:

Mining Tenement Information copyright State of Queensland  
(Dept. Mines and Energy)

Queensland Wetland Data 100K (May\_2009) - DERM

SCALE: 1:400,000 (A3) GDA94 Lat/Long



### LEGEND

- Upstream Infrastructure Corridor 20091201
- Export Pipeline RevEIS 20091201
- Woleebee Creek Option RevEIS 20091201
- Water Collection Header RevEIS 20091201

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

**QCC**

A BG Group business  
GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
w <http://www.qgc.com.au> e [qgc@qgc.com.au](mailto:qgc@qgc.com.au)

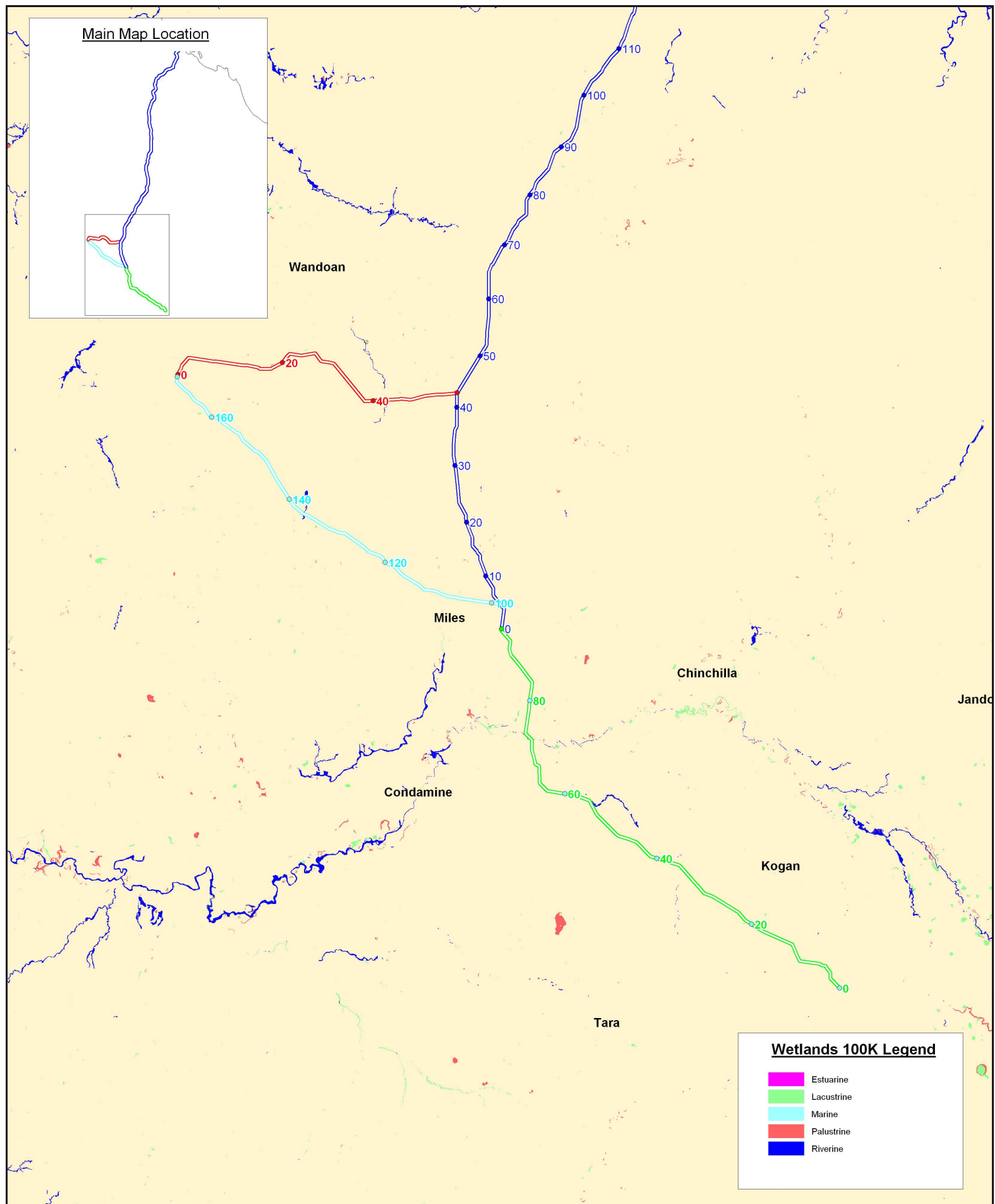
UNIDEL

### AREA OF DETAIL









			ringtanks	
260	400 m	Upstream	Artificial wetland – dams, ringtanks	
281	470 m	Upstream	Modified - dam or weir – Callide Dam	
282-284	180 m	Upstream	Four patches of RE 11.3.25 – riverine – Callide creek	
290	Intersects		RE 11.3.25 – riverine – Rainbow Creek	Commonly dry ephemeral watercourse
291	Intersects		RE 11.3.25 - riverine – Rainbow Creek	Commonly dry ephemeral watercourse
291.5	Intersects		RE 11.3.25 - riverine – Rainbow Creek	Commonly dry ephemeral watercourse
331	Intersects		RE 11.3.25 – riverine – Harper Creek	Commonly dry ephemeral watercourse
332	290 m	Upstream	RE 11.3.27f	Non remnant in Qld Herbarium mapping
333-334	30 to 130 m	Intersects	Three patches of RE11.3.27b	Non remnant in Qld Herbarium mapping
334.5	225 m	Upstream	Artificial wetland – dams, ringtanks	Non remnant in Qld Herbarium mapping
337	160 m	Downstream	RE 11.3.25 – riverine – Calliope river	Non remnant in Qld Herbarium mapping

The findings of the field assessment of the watercourses to be traversed by the CGC are summarised in *Table 5*. The majority of the creeks transected by the pipeline were found to be narrow strips of vegetation in average condition and often subjected to heavy grazing.

**Table 5: Creeks traversed by the CGC**

KPs	Feature	Type	General Condition
314	Unnamed	Minor, non-perennial	Non-remnant, good condition woodland
324	Calliope River	Major, perennial	REs 11.3.4/11.3.4/11.3.25, average condition
332	Harper Creek	Minor, non-perennial	Non-remnant, average condition, large trees present
336.4	Alarm Creek	Minor, non-perennial	Non-remnant, presence of weeds (e.g. rubber vine, lantana), highly degraded site, gully 20m deep
340	Sandy Creek	Minor, non-perennial	Non-remnant, heavily grazed
347.2	Gravel Creek	Minor, non-perennial	Non-remnant, heavily grazed
349.6	Larcom Creek	Minor, non-perennial	REs 11.3.4, 11.3.26, 11.11.15/11.11.15, 11.3.4/11.3.25, good condition

#### **5.4.2 Woleebee Creek Pipeline**

Review of the Queensland Wetlands Mapping identified only one fringing riverine (RE 11.3.25) along Juandah Creek which the Woleebee Creek Pipeline route traverses at approximate KP 42 (*Figure 12*). This is a commonly dry ephemeral watercourse.

#### **5.4.3 Collection Header Pipeline**

The Collection Header Pipeline corridor crosses the Queensland Wetland RE 11.3.25 at three locations as follows:

- Nine Mile Creek at KP 55
- Condamine River at KP 72.5
- Wallan Creek at KP 136.5.

Nine Mile Creek and Wallan Creek are dry ephemeral watercourses. The Condamine River is periodically dry at the crossing location but is a regionally significant river (see *Figure 12*).

### **5.5 DERM Environmentally Sensitive Areas**

Environmentally sensitive areas (ESAs), as mapped by DERM ESA on-line mapping, that occur within or in the vicinity of the pipeline corridors generally remain the same as that described in the draft EIS (*Figure 13*). Note that the only changes arise from:

- Alignment of the Export Pipeline through the CGC which traverses the Targinie State Forest between KPs 376 and 376.6; and
- The proposed widening of the Collection Header corridor through Braemar State Forest.

The CGC traverses Targinie State Forest at KP 376 for approximately 600 m. RE mapping indicates that this area is generally made up of *Corymbia citriodora* and *Eucalyptus crebra* woodlands (RE 11.11.3) which is listed as not of concern under the VM Act.

Since the release of the draft EIS the width of the Collection Header corridor has increased in some sections and decreased in others. The section of the Collection Header that passes through the Category C ESA Braemar State Forest (KP 0-5.5) has increased from a width of 80 m to 125 m. For the purpose of determining clearing impacts the corridor has been taken to have a width of 135m. This increase in clearing width is a result of refinements to the pipeline corridors which have lead to the co-location of gas extraction infrastructure within this corridor.

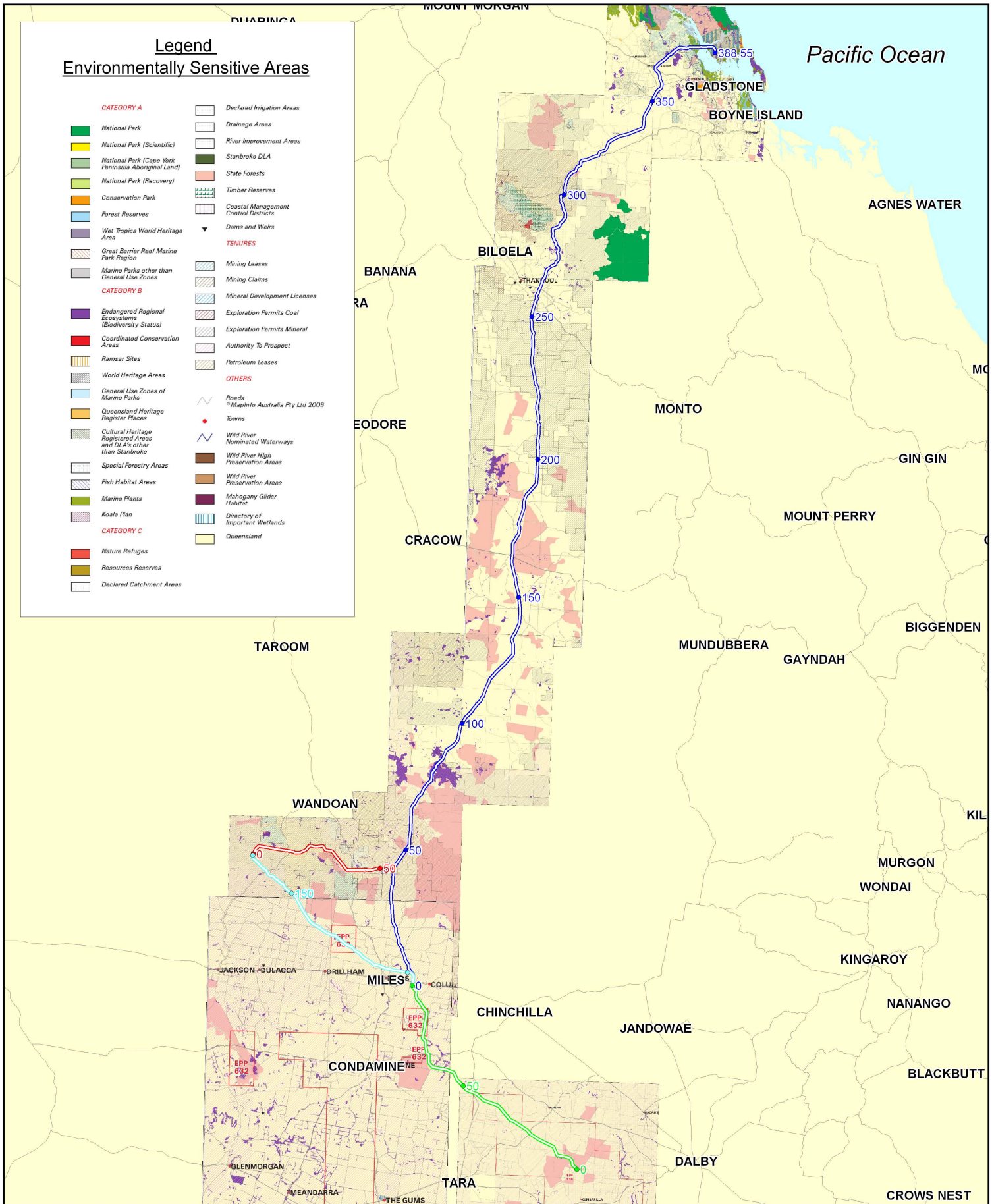
This increase in corridor width may lead to the clearing of the not of concern mixed community RE 11.7.6/11.5.4 (*Corymbia citriodora* and *Eucalyptus crebra* woodland). No EVR flora species are known to occur within or close proximity to the proposed corridor route.



## Legend

### Environmentally Sensitive Areas

- CATEGORY A**
- National Park
  - National Park (Scientific)
  - National Park (Cape York Peninsula Aboriginal Land)
  - National Park (Recovery)
  - Conservation Park
  - Forest Reserves
  - Wet Tropics World Heritage Area
  - Great Barrier Reef Marine Park Region
  - Marine Parks other than General Use Zones
- CATEGORY B**
- Endangered Regional Ecosystems (Biodiversity Status)
  - Coordinated Conservation Areas
  - Ramsar Sites
  - World Heritage Areas
  - General Use Zones of Marine Parks
  - Queensland Heritage Register Places
  - Cultural Heritage Registered Areas and DLA's other than Stanbrooke
  - Special Forestry Areas
  - Fish Habitat Areas
  - Marine Plants
  - Koala Plan
- CATEGORY C**
- Nature Refuges
  - Resources Reserves
  - Declared Catchment Areas
- Declared Irrigation Areas
- Drainage Areas
- River Improvement Areas
- Stanbrooke DLA
- State Forests
- Timber Reserves
- Coastal Management Control Districts
- Dams and Weirs
- TENURES**
- Mining Leases
  - Mining Claims
  - Mineral Development Licenses
  - Exploration Permits Coal
  - Exploration Permits Mineral
  - Authority To Prospect
  - Petroleum Leases
- OTHERS**
- Roads
  - Towns
  - Wild River Nominated Waterways
  - Wild River High Preservation Areas
  - Wild River Preservation Areas
  - Mahogany Glider Habitat
  - Directory of Important Wetlands
  - Queensland



CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 13.

DATE: 03-December-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

Environmentally Sensitive Areas Raster copyright EPA

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20 -10 0 10 20 30 40

Kilometres

## LEGEND

- Water Collection Header RevEIS 20091201
- Export Pipeline RevEIS 20091201
- Woleebee Creek Option RevEIS 20091201
- Upstream Infrastructure Corridor RevEIS 20091201

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

**QCC**

A BG Group business  
GPO Box 3107 - Brisbane QLD 4001  
p (07) 3024 9000 f (07) 3024 8999  
http://www.qgc.com.au e qgc@qgc.com.au

**UNIDEL**

## AREA OF DETAIL



## 6 POTENTIAL IMPACTS

### 6.1 Clearing of ecological communities/regional ecosystems

The figures presented in *Table 6* provide a comparison of the worst case clearing areas presented in the draft EIS to the current situation (since refinement of the Project design).

**Table 6: Comparison of the draft EIS and supplementary EIS worst case vegetation loss areas**

RE/Ecological community status	Clearing extent draft EIS (ha)	Clearing extent supplementary EIS (ha)
<i>EPBC Act</i> listed <sup>2</sup>	17	12
Endangered	18	13
Of concern	105	24
Not of concern	1,339	918
<b>TOTAL</b>	<b>1,462</b>	<b>967</b>

There is a notable decrease in the clearing extent of all remnant vegetation presented in the draft EIS in comparison to the current clearing areas. This is primarily due to the decrease in the overall width and corresponding clearing extent of the Collection Header corridor (See *Table 1*).

In order to place the potential impacts of the pipeline construction within a local and bioregional perspective, the following estimates have been made and presented in *Table 7*:

- The total known area of *EPBC Act* listed ecological communities within the proposed corridors 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 Gas Fields and the estimated extent and percentage of the total area that may be impacted
- Comparisons are also made with the overall extent of these RE categories within the Bioregion.

<sup>2</sup> *EPBC Act* listed communities are overlapping (and not additional to) *VM Act* REs



**Table 7: Worst case vegetation loss**

RE Status	Clearing extents (ha)	Extent within 5 km (ha)	% of that within 5 km to be cleared (ha)	Extent in Bioregion	% of that within Bioregion to be cleared
EPBC Act listed*	12	4642	0.26	389,100	0.003
Endangered	13	4581	0.28	377,147	0.003
Of concern	24	8949	0.27	1,450,717	0.002
Not of concern	918	211,937	0.43	6,952,193	0.013
TOTAL	967	230,110	0.42	9,169,158	0.011

\* EPBC Act listed Communities are overlapping (and not additional to) VM Act REs

The actual area of clearing for the proposed pipeline is likely to be lower than this estimate, as:

- The ROW may be able to utilise existing cleared infrastructure corridors through remnant vegetation (at least in part)
- Pipeline construction will not require clearing of the full clearance widths which have been used in these calculations.

## 6.2 EVR flora

Since the release of the draft EIS the proposed Export Pipeline alignment has been refined to avoid, wherever practicable, all EVR flora species that were identified during the detailed flora surveys. Note that the Export Pipeline alignment may not be able to avoid some impacts on the endangered flora species *Cycas megacarpa* (Large-fruited Zamia) which was observed at approximate locations KP 297, 305, and 310 along the Export Pipeline alignment. Approximately 150 *Cycas megacarpa* plants were observed within the pipeline corridor. According to the field surveys some thousands of individual plants are spread along the range slopes which occur on either side of the proposed Export Pipeline route. Due to this species restricted habitat niche being along the ranges that the pipeline will have to cross, clearing/disturbance of up to approximately 150 plants may be required.

In 2007 the Queensland Herbarium found that the total number of adult *Cycas megacarpa* within Queensland was greater than 372,900 individuals. In comparison to this number and the numbers (some thousands) of plants immediately adjacent to the proposed corridor the total individuals to be affected by the Project are unlikely to lead to a long-term decrease in population size and/or fragment an existing population into two or more populations. It is therefore considered that the proposed action will not have a significant impact on this species.

Notwithstanding this, management measures to reduce impacts on *Cycas megacarpa* should be implemented. Recommended mitigation measures have been provided for in Section 7.

### 6.3 EVR fauna and habitat values

As described in *Section 5.3.1*, the shared Callide-Gladstone Corridor traverses cleared pasture lands with native vegetation occurring in the creeklines. The understorey is heavily grazed within the creeklines, however, there are fallen trees which may provide habitat for some fauna species. Callistemons and eucalypts in these creeklines are likely to provide nectar sources for birds and at the time of the survey many species were seen to be feeding along the creeks. As these creeks contain linear vegetation in an otherwise cleared landscape, they do provide some local wildlife movement corridor values.

Overall, due to the small and relatively fragmented nature of these creek habitats, fauna habitat values are considered to be medium to low.

The only EVR fauna species that was observed during the CGC field survey was *Geophaps scripta scripta* (Squatter Pigeon). This species, listed as vulnerable under both the *EPBC Act* and *NC Act*, was recorded at approximate KP 322 along the Export Pipeline.

The Squatter Pigeon is recognized as nomadic, highly mobile and occupies very large home ranges. When identified along the corridor, this species has invariably been found in open grazing lands (non-remnant) and in close association with cattle. Very little remnant vegetation occurs in these areas, other than along creeklines where the birds may visit to drink. Given the small area of habitat that may be cleared for pipeline construction (possibly less than 1ha in the bird's identified habitat area) it is expected that the proposed corridor will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Thus it is projected that impacts upon this species will not be significant.

### 6.4 Aquatic ecology

The amendments to the project description of the pipeline component of the Project will not result in impacts to aquatic environments additional to those identified in *Appendix 4.2*, *Section 8.4* of the draft EIS.

### 6.5 DERM Environmentally Sensitive Areas

All potential impacts to any ESAs (as mapped by DERM ESA on-line mapping) that occur within or in the vicinity of the Projects pipeline corridors are generally the same as those which were presented in *Appendix 4.2* of the draft EIS. Note that the only changes to this position arise from the location of CGC and the refinement of the Collection Header route.

The CGC traverses Targinie State Forest at KP 376 for approximately 600 m. This will cause some fragmentation of the northern section of the State Forest and reduction of woodland habitats. The area was not visited during the ground survey conducted along the CGC and will be surveyed once the final location is confirmed by the State Government.

The co-location of infrastructure within the Collection Header corridor will result in an increase to the corridor width and therefore may increase clearing within Braemar State Forest. Some sections of the proposed corridor follow an existing cleared easement to minimise impacts.

Impacts on flora and fauna values are expected to be similar to those already described in the draft EIS (i.e. loss of habitat and fragmentation effects). Detailed ecological surveys will be completed prior to final alignment selection.

From an ecological perspective, the additional width of clearing through the Braemer State Forest, whilst undesirable, is still preferred to the alternative of constructing separate easements for linear gas extraction infrastructure. The creation of separate easements would increase the extent of habitat fragmentation, increase edge effects and would facilitate predator access across a wider area of the State Forest. In summary, this widening of the Collection Header corridor within the Braemer State Forest is not expected to significantly alter the findings presented in the draft EIS in relation to the overall significance of potential impacts on Environmentally Sensitive Areas.

## 6.6 Cumulative impacts

The draft EIS did not consider the cumulative impacts of the Surat Gladstone Pipeline Project which originates in the Surat Basin and runs approximately parallel to the southern portion of the Collection Header and the Export Pipeline before it crosses The Narrows to Curtis Island.

Any cumulative impacts that may result from the Surat Gladstone Pipeline Project and the QCLNG Pipelines will depend upon the final alignments selected and the nature of the vegetation traversed. However, according to information provided in the Surat Gladstone Pipeline Project EIS, the proposed alignment passes through similar vegetation and topography to the QCLNG Export Pipeline. The long term cumulative impacts from both projects are likely to be similar to those proposed for each individual projects, that is some loss of vegetation/habitat and fragmentation within contiguous expanses of remnant vegetation generally through a largely pre-disturbed landscape.

There are cumulative impacts on *Cycas megacarpa*, an *EPBC Act* listed endangered plant species found on the spurs and ridges of the Calliope Range. The combined loss for this species is likely to be less than 300 individuals, representing only 0.08 % of the total *Cycas megacarpa* population that has been recorded within Queensland. Additionally thousands of individuals will still be retained in the vicinity (Refer to *Table 8*).

**Table 8. Cumulative Impacts on *Cycas megacarpa***

	Surat to Gladstone Pipeline Project	QCLNG Pipeline Project	Total
<i>Cycas megacarpa</i> loss	150	150	300
% of total population (370,000)	0.04	0.04	0.08

Provided that both projects develop mitigation measures to minimise impacts on remnant vegetation and key fauna habitats as well as providing offsets for unavoidable impacts, cumulative impacts are projected to be minor. Additionally, the co-location of pipeline infrastructure within the Callide Gladstone Corridor will reduce the cumulative impacts of multiple pipeline projects between the Callide Range and Gladstone.

Mitigation measures that QGC will put in place to minimise impacts on *Cycas megacarpa* are provided in *Section 7*.

## 7 MITIGATION AND REHABILITATION RECOMMENDATIONS

Mitigation measures proposed in the draft EIS are believed to be adequate to flora and fauna values identified to date. Where avoidance is not possible, offsets will be proposed. The QCLNG Draft Submission on Vegetation and Biodiversity Offsets provides additional information on the proposed offsetting program.

The flora species *Cycas megacarpa* will require additional consideration and management measures to minimize impacts on this species. Wherever practicable, the proposed Export Pipeline has been aligned so as to minimise impacts upon this species. Where avoidance is not possible a Threatened Species Management Plan that proposes specific remedial actions will be developed. This Management Plan will be developed in accordance with the guidelines proposed by the *Draft Cycad Recovery Plan* (Forster and Holland, 2005). The plan will identify overall goals, such as no net loss of viable populations and experts will be consulted throughout the development of appropriate remedial measures.

Offsets will be proposed for all unavoidable impacts on the *Cycas megacarpa* in accordance with agency requirements and the QCLNG Draft Submission on Vegetation and Biodiversity Offsets.

## 8 DETAILED RESPONSE TO SUBMISSIONS

### 8.1 DERM Submission (Submitter Number 32)

#### ***Summary of submission***

*The analysis of aquatic flora species should be expanded to include species which have strong associations with, or form important fringing habitat to wetlands.*

#### **Response to submission**

Field surveys along the Export Pipeline found that almost all freshwater wetland habitats are ephemeral in nature and subject to prolonged periods without water. The only exceptions are a number of artificial water sources such as dams and ring tanks that might be considered as permanent. Thus freshwater aquatic flora species that characteristically occur in association with aquatic systems are relatively depauperate.

Flora species that may occur in association with wetland systems are described in the draft EIS in *Volume 4, Chapter 8, Section 8.1.2.1* and include three EVR flora species (*Aponogeton queenslandicus*, *Eleocharis blakeana* and *Fimbristylis vagans*). No EVR aquatic flora species were found during the surveys.

#### ***Summary of submission***

*The analysis of aquatic species should be expanded to include species which have strong associations or depend on wetlands for significant breeding or feeding habitat.*

#### **Response to submission**

Species that have close associations with wetland habitats for breeding or foraging include waterfowl and other bird species that require dense grass or reeds (for example birds such as Reed Warblers, Snipe and some species of Quail), some mammals (such as the Rufous Bettong) and also a number of reptiles (e.g. Dunmall's Snake) and amphibians (e.g. frogs). In the case of reptiles and frogs, most species show strong affiliation with seasonally and ephemerally wet habitats such as black soil gilgais, and not with wetlands per se. In the case of bats, the only known Australian species dependant on aquatic habitats for foraging, is the Large-footed Myotis. This species has not been recorded from the Project area but may occur close to the coast in the Gladstone area. Other tree-dwelling species may be closely associated with riparian areas where they make use of tree hollows in the larger Eucalypts for roosting and maternity purposes.

All of these species are considered in the draft EIS. In particular, EVR species, including some of the aforementioned mammals, reptiles and frogs, are detailed in *Appendix 4.2* of the draft EIS. *Appendix 4.2* of the draft EIS describes the anticipated degree of impact that may occur to these species. *Volume 3, Section 8, Section 8.4* of the draft EIS describes the mitigation measures that will be employed to minimise impacts on aquatic and terrestrial species. In nearly all cases, the potential level of impact for wetland dependant species is projected to be low (the exception is Painted Snipe: moderate). This is because of the very limited extent of freshwater wetlands in the vicinity of the

alignment, the characteristics of those wetlands (i.e. predominantly ephemeral watercourses) and the temporary nature of the anticipated disturbance.

The mitigation measures already developed for the protection of riparian corridors and other habitats of potentially high conservation value will be sufficient to protect freshwater wetland-associated flora and fauna. These guidelines include the reinstatement of drainage patterns after construction, erosion management, and minimal clearing of native vegetation (such as the clearing of creek lines and watercourses. Detailed pre-clearance surveys will be used to identify key ecological values, including habitat trees and other key microhabitat features for protection. The draft EIS also recognises riparian areas (amongst others) as priority habitats for the Offsets Strategy.

### ***Summary of submission***

*Reference should be made to least concern, near threatened, rare, vulnerable, endangered wildlife and DERM Back on Track species prioritisation process.*

### **Response to submission**

Throughout the supplementary EIS the term 'EVR' has been used to describe all species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (*EPBC Act*) as extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent and under the *Nature Conservation Act 1992* (Qld) (*NC Act*) as extinct in the wild, endangered, vulnerable, rare, and near threatened.

The DERM Back on Track species prioritisation framework has been referenced and will be used in the management plans for EVR species that have the potential to be impacted by the proposed development. See *Volume 4, Chapter 7, Section 7.6*.

### ***Summary of submission***

*The supplementary EIS should consider the establishment of buffers zones between the various construction and operational activities and significant wetland areas and watercourses including reference to width, cover, slope and drainage requirements.*

### **Response to submission**

With the exception of the marine estuary wetland adjacent to The Narrows, which are discussed in *Volume 5, Chapter 7* of the draft EIS, the only watercourses present along the proposed alignment are dry ephemeral creeks. Where creek crossing is unavoidable mitigation measures will include stockpiling of topsoil and trench soil outside of the riparian vegetation area. Other mitigation measures for riparian areas are detailed in *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS. Where possible, crossing of riparian areas by linear infrastructure will be done at 90 degrees to avoid unnecessary clearing.

### ***Summary of submission***

*Other sources of information, including the Queensland Wetlands Mapping and field surveys, should be used and reviewed to identify important wetland areas in proximity to, or likely to be affected by the proposed pipeline corridor.*

**Response to submission**

Refer to Section 5.4 of this report.

**Summary of submission**

*The supplementary EIS should identify the impacts of weed introduction to wetlands and watercourses; direct interference to the direction and volume of flows and appropriate mitigation measures.*

**Response to submission**

Very few natural, permanent wetlands exist in the area and the watercourses are ephemeral. Impacts to wetlands and watercourses include weed infestation, erosion and the alteration of drainage patterns.

Larger ephemeral watercourses, such as the Condamine River, provide sufficiently moist habitats for the establishment of weeds that may not occur elsewhere. These include castor oil bush and noogoora burr. In many cases such species have already established in these areas quite independently of any project activities. The draft EIS recommends stringent weed management guidelines (Section 8.3, Appendix 4.2), these will help protect wetlands, watercourses and riparian areas from introduction and spread of weeds (including aquatic and aquatic-related weed species).

Erosion is currently widespread across the large portions of the traversed landscape in susceptible habitats as a result of cattle grazing and other farming and construction activities. Pre-testing of soil types and erosion control plans will be implemented for all project activities, as described in the draft EIS, and corrective actions will be undertaken as required in order to control erosion. Rapid rehabilitation of watercourse crossings will be undertaken as a matter of priority.

The main infrastructure that may be required to cross watercourses consists of linear elements such as pipelines and associated access roads. In all cases, these will either be built to an appropriate standard, such that water flows are unimpeded, or shall be contoured after construction to follow natural contours so that no alteration of natural flows will occur. In all cases, the impacts on the direction of flow and volume of water are projected to be negligible.

**Summary of submission**

*A field assessment of aquatic ecological values should be provided undertaken for the supplementary EIS. These field surveys should target areas identified from the desktop assessments as providing suitable habitat for EVR species. The supplementary EIS should provide details of both the values identified from these surveys and any specific mitigation measures that may manage potential impacts.*

**Response to submission**



No major infrastructure will be located in close proximity of any watercourses or water bodies. The only infrastructures that will, where unavoidable, cross watercourses are pipeline and temporary construction access. Mitigation measures which will protect aquatic ecological values are described in *Volume 4, Chapter 8, Section 8.4* of the draft EIS. With the application of these mitigation measures, the potential impacts that may arise from pipelines are minimal.

As such, and in light of the ephemeral nature of the traversed watercourses, further field assessments are not considered necessary or proposed in relation to the pipeline component of the Project.

**Summary of submission**

*Details should be provided in relation to the proposed strategy and methodologies to be employed to rehabilitation works. This detail should include an indication of specific performance measures, thresholds and monitoring for determining the success of proposed rehabilitation works.*

**Response to submission**

Rehabilitation measures are discussed in *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS.

A detailed monitoring plan will be developed prior to construction and implemented in order to monitor the success of rehabilitation and help identify where rehabilitation procedures require modification.

Monitoring sites will be established in disturbed and adjacent undisturbed sites to allow comparisons to be made, while controlling for variables relating to factors other than the project activities.

Monitoring sites will also provide data on changes occurring in disturbed areas over time. Monitoring of disturbed areas will continue until success thresholds are achieved or cessation of monitoring is otherwise justified (e.g. effective soil stabilisation achieved).

Performance objective is to achieve 50 per cent of native and/or exotic pasture ground covers of adjoining areas within 2 years.

**Summary of submission**

*The draft EIS failed to address any potential impacts on the EPBC Act listed threatened ecological community 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'.*

**Response to submission**

Refer to *Section 5.4* of this report

**Summary of submission**



*The EIS should ensure that environmental values of groundwater dependent ecosystems are recognised, potential impacts are fully assessed and appropriate mitigation measures are adopted.*

### **Response to submission**

Groundwater dependent ecosystems (GDEs) are typically associated with surface drainage features or shallow groundwater resources related to aquifer recharge and discharge zones. The extent of GDE dependency on groundwater can range from being marginally to entirely dependent on groundwater. The Hydrogeological Framework Report for the Great Artesian Basin Water Resources Plan Area (2005) includes a discussion of the two types of GDEs that are most relevant to the QCLNG Project area:

- Springs (including recharge, discharge, and/or mound springs of the GAB)
- Rivers receiving baseflow.

No springs are located along or in close proximity to the proposed pipeline corridors and therefore will not be impacted by pipeline construction activities.

Wherever the pipelines cross watercourses stringent mitigation measures will be in place to avoid disturbance to associated GDEs. These mitigation measures are discussed in Pipeline EMP (*Volume 10* of the draft EIS).

Subterranean ecosystems and phreatophytic terrestrial vegetation are not included within the scope of the Terms of Reference for this EIS.

### **Summary of submission**

*The supplementary EIS should address the impacts to fauna in both the development and operational phases of projects including potential for species composition changes due to fragmentation and edge effects, management of fauna mortality, loss of access and corridors, and use of fencing material.*

### **Response to submission**

The construction of the pipeline and CSG Field infrastructure will require some clearing of vegetation which will result in habitat fragmentation for some fauna species. One of the effects of such clearing is the potential change in the fauna composition. Some bird species (e.g. Noisy Miner, *Manorina melanoleuca*) are found preferably in heavily disturbed and degraded patches of forest where the understorey has been grazed (Grey *et al.* 1997, 1998). In fragmented remnants these more adaptable birds also display very aggressive behaviour and actively exclude other smaller bird species (Grey *et al.* 1997, 1998, Maron, 2009). As a result, the species composition of avifauna and other fauna groups subject to clearing can potentially be altered.

However, the clearing footprint for the pipelines is relatively small compared with the effects of grazing and inappropriate fire regimes which have already substantially altered most of the vegetation communities within the study area. As such, the changes to species composition due to construction of the pipelines is most likely negligible.

Birds such as Noisy Miners, crows, magpies are already established in abundance in all areas visited during the fauna surveys including State Forest areas. These species will

be monitored as part of the Project's ongoing environmental evaluation, but it is not expected that any increase in the distribution of abundance of these species will be attributable to the Project.

The creation of further access roads in the proposed project area may increase the risk of animal mortalities (livestock or native fauna) due to increased vehicle movements during both construction and operational phases.

Road kills will be monitored and recorded by construction and operations personnel who will be instructed to report fauna/vehicular impact, and mitigations will be implemented where required. Mitigations will include reduced speed limits, signage and restriction of traffic to daylight hours where possible.

There are no locations where the concentration of wildlife movement and traffic loads would justify provision of underpasses, overpasses or glider poles. However, glider poles or special walkways for koalas to safely negotiate roads and fences could be implemented if a specific location is found by the monitoring to have a significant road mortality risk.

Any clearing of vegetation has the potential to create a barrier to wildlife movement. Some small mammals and birds may be deterred from crossing cleared zones and also suffer greater predation. Small ground dwelling animals, which are generally less mobile, such as burrowing reptiles and amphibians can be more sensitive to barrier effects, while highly mobile species (e.g. birds and bats) are less likely to be affected.

In almost all cases, the relatively narrow clearances required for roads and pipelines will create only minor barriers. In some cases however, where site clearances identify the potential for more serious impacts (for example, where EVR species or habitat trees are identified), special measures will be adopted to manage these. Measures will include:

- Minimal clearance of vegetation
- Re-routing to avoid critical areas (e.g. EVR plant species)
- Replacement of litter and mulched vegetation as cover, along roadside verges and across pipelines.

It is highly unlikely that the dispersed nature of the development will create significant barriers to the movement of species such as gliders or koalas. However, glider poles or special walkways for koalas to safely negotiate roads and fences could be implemented if a specific location is found by the monitoring to have a significant road mortality risk.

Where fencing is required within the project area, the use of barbed wire fences will be negotiated with the landholder and avoided if possible. QGC will use only non-barbed wire in areas where species such as gliders and larger bats are likely to occur (i.e. Yellow-bellied Gliders in tall Spotted Gum forests (i.e. *Corymbia citriodora*), near identified sap feeding trees).

The only exception may be where a landholder requires barbed-wire fencing to replace existing barbed-wire fencing.

*Volume 4, Chapter 7, Section 7.5.2* of the draft EIS describes the mitigation measures to be implemented during the project's life. These include measures for minimising and offsetting impacts to fauna through revegetation, weed management, fire management and reduced infrastructure placement in areas of high conservation value.

Rehabilitation activities after the cessation of project activity, aimed at restoring habitat values, include the following;

- the breaking up of hardened surfaces and restoration of natural surfaces and contours unless the landholder wishes the road to remain
- re-seeding with local native flora, where appropriate
- the resspreading of vegetative material over cleared areas
- regular monitoring of regeneration on a monthly basis for 6 months and then bi-annually for a further two years.

### **Summary of submission**

*The final route of the Export Pipeline should be surveyed, to the extent that the route varies from what was assessed for the draft EIS.*

### **Response to submission**

The current Export Pipeline alignment has now been fully assessed. These surveys include a detailed walk-through flora and fauna habitat survey undertaken between KPs 0-300 and the assessment of watercourses and regrowth areas along the proposed extension of the Callide Gladstone Corridor (approx KPs 311 and 350 along the Export Pipeline). Note that if necessary, further flora and fauna surveys will be conducted within the Callide Gladstone Corridor once the final route has been selected and supplied by the Department of Infrastructure and Planning (DIP). Ecologists will resurvey any future realignments from the surveyed route within native vegetation areas prior to commencement of construction.

### **Summary of submission**

*At least two reference sites should be developed from which to develop benchmarks, and to provide on-going reference for environmental management and rehabilitation activities. The sites should be selected to represent the major natural ecosystems being significantly impacted by the project, and should be sufficiently removed from the project to be unaffected by the project's activities. The sites should be monitored at the same intervals and with the same methodology as that used for on-site monitoring.*

### **Response to submission**

Volume 3, Chapter 7, Section 7.6 of the draft EIS proposes a series of management zones with varying levels of development constraints, depending upon the perceived conservation value of each zone. As part of the development, monitoring sites will be established in each of these zones, as well as within the major vegetation groups transacted by the pipelines, as benchmarks to be used in monitoring environmental management and the progress of revegetation and rehabilitation. Monitored development sites and reference sites will be chosen in similar habitats and monitored using the same methodology so as to control variables that may otherwise bias results and render the comparison invalid. In addition, habitats proposed as offsets will also be monitored in order to track their rehabilitation and biodiversity status.

Detailed monitoring programs will be developed and form a separate Monitoring Plan for both the Gas Field and Pipeline Components of the Project.

**Summary of submission**

*Details should be provided in relation to the proposed strategy and methodologies to be employed to rehabilitation works. This detail should include an indication of specific performance measures, thresholds and monitoring for determining the success of proposed rehabilitation works.*

**Response to submission**

Rehabilitation measures are discussed in *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS.

A detailed Monitoring Plan will be developed prior to construction and implemented in order to monitor the success of rehabilitation and help identify where rehabilitation procedures require modification.

Monitoring sites will be established in disturbed and adjacent undisturbed sites to allow comparisons to be made, while controlling for variables relating to factors other than the project activities.

Monitoring sites will also provide data on changes occurring in disturbed areas over time. Monitoring of disturbed areas will continue until success thresholds are achieved or cessation of monitoring is otherwise justified (e.g. effective soil stabilisation achieved).

The Project's revegetation performance objective is to achieve 50 per cent of native and/or exotic pasture ground covers of adjoining areas within two years.

**Summary of submission**

*DERM Environmentally Sensitive Areas to be included for assessment should reflect those identified in Section 25 and 26 of the Environmental Protection Regulation 2008, and the attached list of category C sensitive areas. The presence of all ESA's should be mapped and the management of each type addressed.*

**Response to submission**

The draft EIS considered all category A and B environmentally sensitive areas (ESAs) as prescribed in s25 and 26 of the *Environmental Protection Regulations (EP Regs) 2008* (Qld) and the category C Areas as identified by the Department of Environment and Resource Management (DERM) ESA mapping. The draft EIS identified all of these ESAs within proximity to the project and discussed the management of these areas (See *Section 7.11, Appendix 4.2* of the EIS).

QGC recognises that some of the Category C areas that were identified in the list supplied by DERM in response to the draft EIS that are not codified in legislation or available through DERM's online mapping service or provided in the Project's Terms of Reference were not addressed. Thus, the approach that was taken in the draft EIS will also be used in the supplementary EIS.

Any additional impacts on environmentally sensitive areas that may arise due to a change in Project design since the release of the draft EIS have been identified and discussed in *Section 6.5* of this report.

### **Summary of submission**

*Commitments to minimising impacts to native flora and fauna and application for the clearing of native plants are required to be consistent with the requirements of the Nature Conservation Act 1992. If necessary, an offset proposal for the clearing of endangered, vulnerable, rare and near threatened plant species should be provided.*

### **Response to submission**

QGC has (for its existing operations) and will continue to put in place mitigation measures to minimise impacts to native plants. As was provided in *Volume 3, Chapter 7, Section 7.6.1* of the draft EIS, pre-clearance surveys will be undertaken for every proposed road, well pad and pipeline to enable detection and avoidance of flora and fauna values. In regards to the Pipeline Component of the project, the corridor impacted for pipeline construction within all areas of remnant vegetation will be minimised wherever practicable. Pre-clearance surveys have been and will continue to be undertaken prior to pipeline finalisation to detect, record and if necessary translocate any endangered, vulnerable, rare or near-threatened (EVR) plant species that may occur along the final pipeline alignment (see *Volume 4, Chapter 7, Section 7.5.2* of the EIS).

To minimise impacts on native fauna, fauna handlers will be present for, and as necessary relocate wildlife immediately prior to and during clearing activities. During pipeline construction qualified fauna spotters and handlers will survey the open trench, record and remove any trapped fauna species. Such surveillance will occur along the entire length of the trench (See *Volume 3, Chapter 7, Section 7.6.1* and *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS).

QGC recognises that it may be required to obtain approvals under the *Nature Conservation Act 1992* prior to clearing any native plant species. QGC has commenced and will continue negotiations with DERM on this matter.

QGC proposes a suitable offset for all potential impacts on endangered, vulnerable, rare or near threatened species as listed under the *NC Act*. For further details please see the QCLNG Draft Submission on Vegetation and Biodiversity Offsets.

## **8.2 Callide Valley Landcare Group (Submitter Number 1)**

### **Summary of submission**

*Concerns were raised in regards to the spread of weeds along the pipeline alignments. Proposed vehicle wash downs at every property boundary.*

*The proponent should develop strategies for regular monitoring and control of weeds during the operation phase of the pipeline. The management strategies should be weed species specific.*

*The proponent should clarify the meaning of 'designated weed washdown area' as council advises that all vehicles, equipment and portable infrastructure, will still be required to washdown at established Shire facilities, by a Trained Weed Inspector prior to arrival and leaving the Shire. Council would also expect Weed Hygiene Declaration Certificates and Washdown Certificates to be utilised by the proponent.*

*Council expects a full weed management plan to be developed especially for the construction and operational stages of the development and that this weed management plan, be a condition of contract for constructors.*

### **Response to submission**

Weed surveys will be carried out prior to the commencement of construction activities (this has already occurred for the majority of the Export Pipeline) to ensure that the various species of concern have been identified and their locations mapped. This mapping will be completed once the alignment for the Queensland Government's proposed Callide Gladstone Corridor is confirmed. The finalised mapping will be taken into consideration in the overall weed management plan.

The weed survey will also assist in planning pre-spraying programs to minimise the likely presence of weed species along the RoW and any access tracks. QGC will be carrying out a full review of weed wash down requirements for the entire Project. Where local facilities are available and have the capacity to handle the size and volume of equipment used by the Project these will be utilised. Where required, temporary wash down facilities will also be constructed at strategic locations (e.g. camp sites) along the pipeline route based on the direction and flow of construction.

Normally large plant and equipment that can take several days to clean down correctly are cleaned at entry to the pipeline right-of-way (ROW). In pipeline construction it is not possible to do full wash downs at every property boundary as some of the plant and equipment may take up to 4 days to clean down completely. This plant and equipment would not normally be washed down again until the end of construction but would travel along the cleared ROW where it would not encounter any viable weed material.

In addition, a pre-spraying program would be undertaken along the ROW to assist in weed hygiene management.

Weed inspections will continue on a regular basis as part of the overall pipeline operations and maintenance program. A Weed Management Plan will be developed prior to construction and will include the use of licensed weed control contractors. Weed hygiene certification would be required as part of the weed management plan.

Landowner requirements in relation to the movement of pipe trucks, plant, equipment and other vehicles will be agreed as part of the land access negotiation agreements.

Local Government Area Pest Management Plans have been sourced and will be used in finalising the Weed Management Plan. It will be a contractual condition with construction and operations companies that their own Weed Management Plans be prepared, in accordance with company and local government requirements, and conformed with.

## **8.3 PCCC submission (Submitter Number 23)**

### ***Summary of submission***



*Provide additional information on all offset areas as a result of the construction of the LNG Plant and Pipeline works. The proposed offsets should meet the requirements of the Queensland Government Environmental Offsets Policy (QGEOP) and all relevant specific issue offset policies.*

**Response to submission**

Please refer to the QCLNG Draft Submission on Vegetation and Biodiversity Offsets.

**8.4 Fitzroy Basin Association (Submitter Number 25)*****Summary of submission***

*The council proposes a condition that areas where vegetation cover is reduced to less than 10% are rapidly revegetated and stabilised to prevent loss of soil and ecosystem integrity. Furthermore, the council wishes to see rapid ecosystem establishment along the pipeline to facilitate maximum opportunity for stabilising the terrestrial and aquatic ecosystems that may be disrupted during construction of the pipeline.*

**Response to submission**

As outlined in *Volume 4, Chapter 7, Section 7.4.1* of the draft EIS all disturbance to vegetation as a result of the Project will be rehabilitated as soon as practicable. Rehabilitation measures are outlined in *Volume 3, Chapter 7, Section 7.6.3* and *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS.

**8.5 Upper Dawson Branch WPSQ (Submitter Number 34)*****Summary of submission***

*Large habitat trees must be left wherever possible, in particular along watercourses.*

**Response to submission**

Where native vegetation (including riparian vegetation) is required to be cleared, large trees that provide habitat for a number of fauna species will be avoided and retained wherever possible.

## 9 REFERENCES

- Forster, P.I.F. (2007) *Recovery plans for endangered cycads: a model set of objectives and actions using the example of Cycas megacarpa (Cycadaceae) from Queensland, Australia*, Proceedings of Cycad 2005: The 7th International Conference on Cycad Biology, Memoirs of the New York Botanical Garden.
- Forster, P.I.F. and Holland, A.E. (2005) *Draft Recovery Plan for Cycas megacarpa, Cycas ophiolitica, Macrozamia cranei, Macrozamia lomandroides, Macrozamia pauli-guilielmi, Macrozamia platyrhachis 2006–11*, Report to Department of the Environment and Heritage, Canberra, Environmental Protection Agency, Brisbane
- Grey, M.J., Clarke, M.F. and Loyn, R.H. (1997) Initial changes in the avian communities of remnant eucalypt woodlands following a reduction in the abundance of Noisy Miners, *Manorina melanocephala*. *Wildlife Research* 24: 631-48.
- Grey, M.J., Clarke, M.F. and Loyn, R.H. (1998) Influence of the Noisy Miner *Manorina melanocephala* on avian diversity and abundance in remnant Grey Box woodland. *Pacific Conservation Biology* 4: 55-69
- Maron, M. (2009) Nesting, foraging and aggression of Noisy Miners relative to road edges in an extensive Queensland forest *Emu* 109(1) 75–81.
- Neldner, V.J., Wilson, B. A., Thompson, E.J. and Dillewaard, H.A. (2005) 'Methodology for Survey and Mapping of Regional Ecosystems and Ecological Communities in Queensland'. Version 3.1. Updated Version date: 5 August 2005. September 2005. Queensland Herbarium, Environmental Protection Agency, Brisbane. 128 pp.
- Pennay, M. (2002) Vertebrate Fauna Survey, Analysis and Modelling Projects, NSW Western Regional Assessments, Brigalow Belt South. Stage 2. N. N. P. a. W. Service. Sydney, NSW, NSW PWS.



## APPENDIX 1 – CURRICULA VITAE

### Profile

Bruce Thomson has 30 years of experience in a broad range of environmental assessment, management, concept planning, project proposal and development and conservation disciplines. He is a senior ecologist and biodiversity planner and has worked as a professional botanist, wildlife researcher and conservation manager. Bruce has managed scientific and technical staff (project management) and associated budgets and work programs. He has strong communication skills, having negotiated conservation outcomes in difficult situations with potentially hostile stakeholders; published and presented numerous industry papers, workshops and seminars; and participated in media news and documentary interviews.

Bruce's government and university background has provided experience in fauna consultancy work for the mining industry and he was appointed scientific advisor to the Queensland Government's Flying Fox Consultative Committee. Bruce has conducted field surveys throughout the Northern Territory and has conducted wildlife surveys in southeast Queensland for the Queensland Parks and Wildlife Service.

### Qualifications

PhD "Social ecology of the Chocolate Wattled Bat, <i>Chalinolobus morio</i> , in southeast Queensland	University of Queensland
Masters of Business Administration (Marketing, Public Sector & Strategic Management) – includes formal qualifications in HRM	University of New England NSW
Bachelor of Applied Science (Natural Resource Management)	University of Canberra, ACT

### Recent Papers & Publications

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 troughoni* 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 Sheath-tail Bat, *Saccolaimus saccolaimus*. Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane

### Career Summary

2008 – Current	Unidel Group Pty Ltd – Principal Ecologist
2003 – 2008	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 / identification of botanical specimens, nocturnal insects and small mammal bone material
- Elliott and large cage trapping and pit fall trapping of small mammals, reptiles and arthropods
- Extensive involvement with Aboriginal Traditional Owners in fauna survey work in the NT
- Bat survey using mist nets, bat traps, water trip lines, echo-location call analysis, transect methodologies and anecdotal observations
- Anecdotal observations of wildlife and active searching techniques
- Recording of wildlife with automated camera systems (built by Bruce Thomson)

### Relevant Experience

Flora	<ul style="list-style-type: none"> <li>• Botanical surveys, species inventories and biodiversity assessments for projects such as the Yulara development at Ayers Rock</li> <li>• Acquisition planning for national parks such as Kings Canyon NP, Gregory NP on the Victoria River and parts of the Tanami Desert including type specimens for newly recognised species</li> <li>• Monitored and conducted ecological studies on two rare and endangered plant species and described two new species from the northern parts of WA</li> <li>• Curated the NT Herbarium</li> </ul>
Fauna	<ul style="list-style-type: none"> <li>• Involved in the initial capture and captive breeding of the Bilby and Rufous Hare Wallaby (Alice Springs, NT)</li> <li>• Academic supervision of Masters research project on bat roosting ecology</li> <li>• Researched bat behaviour when negotiating steel grills (on mine entrances)</li> <li>• Conducted flying fox taste and smell deterrent chemical trials for fruit crop protection</li> <li>• Research into the social ecology of the Chocolate Wattled Bat (PhD)</li> <li>• Genetic research at Queensland Biosciences Precinct University of Qld, St Lucia</li> </ul>
Conservation Management	<ul style="list-style-type: none"> <li>• Researched and developed concept plans / project proposals for sustainable development of tourism on Queensland Park's estates</li> <li>• Co-authored original concept plan for multi-million dollar, Alice Springs Desert Park</li> <li>• Developed and assisted implement conservation planning strategies in SE Qld</li> <li>• Protected roosting habitat for rare and threatened bat species</li> <li>• Designed and provided advice on the construction of several experimental 'artificial caves' in mining areas</li> <li>• Developed a Species Recovery Plan for three species of Qld endangered bats</li> <li>• Negotiated and implemented ongoing, cooperative research programs</li> </ul>
Other Scientific Services – advisory and public relations	<ul style="list-style-type: none"> <li>• Scientific advisor / founding member - Qld Gvt's Flying Fox Consultative Committee</li> <li>• Advised Melbourne Botanic Gardens, Sydney Botanic Gardens, Mt Isa and numerous local authorities in greater Brisbane</li> <li>• Provided range of botanical services to the NT Government</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• 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</li> <li>• Worked closely with Aboriginal groups to conduct surveys</li> <li>• Presented scientific and conservation papers at international scientific conventions</li> <li>• Wrote survey reports, ministerial briefing notes and popular publications and provided high level advice to senior government staff and conducted workshops</li> <li>• Participated in radio and TV interviews for news reports, documentaries and children's programs to promote conservation</li> </ul>
Administrative and Financial	<ul style="list-style-type: none"> <li>• Recruited, managed, supported and trained effective teams and participated in strategic planning and enterprise bargaining processes</li> <li>• Administered budgets up to \$150,000</li> <li>• Applied for and administered numerous grants ranging from \$5,000 to \$35,000</li> <li>• Coordinated regional industrial placement program for University students</li> <li>• Applied for and implemented EPA license conditions for administrative purposes</li> <li>• Coordinated and supervised management plans for national parks.</li> </ul>

### Profile

Wayne has more than 20 years experience in biological sciences particularly in plant systematics and plant identification, environmental assessment and vegetation mapping. He has worked in Queensland, Western Australian and Victoria on consultancy assignments for industry and government. Wayne's consultancy work has included route selection, environmental surveying, vegetation mapping, and monitoring

Wayne has been involved in developing strategies and guidelines for sustainable development and the protection, enhancement and rehabilitation of species and regional ecosystems.

### Qualifications

B.Sc., M.Sc., The University of Adelaide.

Completed requirements for Ph.D. at the University of Queensland, June 2009.

### Affiliations

Research Associate, Queensland Herbarium.

### Papers & Publications

Lavarack, P.S., Harris, W.K. & Stocker, G.  
*"Dendrobium and its Relatives"* 2000.  
 Kangaroo Press. 287p.

Lavarack, P.S. & Harris, W.K. 2002. "Botanica's  
 Pocket Orchids.  
 Random House, Australia. 2002

### Awards

Received the Australian Service Medal for service to the community.

### Career Summary

- |                    |  |
|--------------------|--|
| Jul 2009 - Present | • Unidel Group – Senior Botanist   |
| 1998 – Present     | • Research Associate at the Queensland Herbarium.  |
|                    | • Casual employee at the Queensland Herbarium – plant identification and vegetation assessment, poisons, advise to clients on weeds and other botanical issues. Writing of rare and threatened plant profiles. Member of the committee that developed the Regional Ecosystem framework |
| Mar – Jun 2009     | • Vegetation mapping and condition assessment of waterways for the Murray Darling Freshwater Research Centre   |
| Jan – Jun 2008     | • National Project Coordinator for the Weed Spotters Program, run by the CRC for Weed Management.  |
| 1998 – Nov 2008    | • Consultant for biodiversity assessments of major development projects  |
|                    | • Botanical surveys and services for local shire councils and environmental groups (e.g. Desert Channels Queensland, Greening Australia, Pine Rivers Shire Council).   |
| 1995               | • Granted study leave for three years to pursue a Ph.D. at the University of Queensland in Systemic Botany.  |

### Areas Of Expertise

- |                      |   |
|----------------------|---|
| • Botanical survey   | • Plant classification and identification |
| • Vegetation Mapping | • Orchids                                 |

### Relevant Experience

- |                  |   |
|------------------|---|
| Botanical survey | • Kikori River (Papua New Guinea) catchment biodiversity study, for the World Wildlife Fund for Nature.   |
|                  | • Botanical survey and vegetation mapping for the proposed 'Missing Link' railway corridor Environmental Impact Assessment for Queensland Rail. |

---

	<ul style="list-style-type: none"><li>• Botanical survey of Shoalwater Bay Defence property for Department of Defence.</li><li>• Botanical survey of HMAS Cerberus Defence property for Department of Defence.</li><li>• Botanical survey of proposed coal slurry pipeline for Tarong Power.</li><li>• Biodiversity surveys for Liquid Niugini Gas. Pipeline route and LNG site selection and botanical surveys.</li></ul>
Scientific biological surveys	<ul style="list-style-type: none"><li>• Invited on two occasions to participate on botanical surveys of the Pilbara region, Western Australia for the WA government.</li><li>• Survey of Mussau Island (PNG) for the National Capital Botanic Gardens, Port Moresby.</li><li>• Expedition to the Torricelli Mountains, PNG for an orchid survey on behalf of the National Capital Botanic Gardens, Port Moresby.</li></ul>
Other relevant experience - Geological expertise	<ul style="list-style-type: none"><li>• In the early part of his career Wayne was employed as a geologist and became Exploration Manager (Eastern Australia) for the Petroleum Division of Western Mining Corporation.</li></ul>