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# PEL 285 Seismic Survey

Review of Environmental Factors | Gloucester Shire Council

Prepared for AGL Upstream Investments Pty Ltd | 1 November 2011

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# PEL 285 Seismic Survey

Final

J11035|Prepared for AGL Upstream Investments Pty Ltd | 1 November 2011

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| Date | 16-08-11 | 01-11-11 | Date | 01-11-11 |



**Document Control**

| Version | Date | Prepared by | Reviewed by |
|---|---|---|---|
| V1 | 02-08-11 | Darren Holloway | Duncan Peake |
| V2 | 10-08-11 | Darren Holloway | Duncan Peake |
| V3 | 16-08-11 | Duncan Peake | Duncan Peake |
| V4 | 05-10-11 | Andrew Wiltshire | Duncan Peake |
| V5 | 21-10-11 | Andrew Wiltshire | Duncan Peake |
| V6 | 01-11-11 | Andrew Wiltshire | Duncan Peake |

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**Submission of Environmental Assessment**

Prepared under the *Environmental Planning and Assessment Act 1979*, Part 5, Section 111.

| | |
|---|---|
| **Environmental Assessment prepared by:** | |
| Name | Duncan Peake |
| Qualifications | BSc (Hons) |
| Address | EMGA Mitchell McLennan Pty Limited<br>PO Box 21<br>St Leonards NSW 1590 |
| **Certification** | I certify that I have prepared the contents of this document and to the best of my knowledge:<br>It is accordance with the requirements of Part 5 of the *Environmental Planning and Assessment Act 1979*;<br>It contains all available information that is relevant to the environmental impact assessment of the development to which it relates; and<br>The information contained in the document is neither false nor misleading. |
| Signature |  |
| Name | Duncan Peake |
| Date | 01-11-2011 |
| In respect of: | |
| **Project to which Part 5 applies** | |
| Applicant Name | AGL Upstream Investments Pty Ltd |
| Contact | Toni Laurie |
| Phone | 02 6558 1139 |
| Address | 22 Tate Street, Gloucester, NSW 2422 |
| Land to be developed | Land within PEL 285 |
| Proposed development | Seismic testing |
| Environmental assessment | A review of environmental factors is attached |
| Signature |  |
| Name | Toni Laurie |
| Date | 01-11-2011 |

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# 1 Introduction

## 1.1 Purpose of the REF

This Review of Environmental Factors (REF) has been prepared by EMGA Mitchell McLennan Pty Ltd (EMM) on behalf of AGL Upstream Investments Pty Ltd (hereafter AGL) for a proposed two-dimensional (2D) seismic survey in the vicinity of Gloucester in New South Wales (NSW). The seismic survey is proposed to investigate the potential for coal seam gas (CSG) resource in accordance with the requirements of Petroleum Exploration Licence No. 285 (PEL 285). PEL 285 is shown in Figure 1.1.

PEL 285 is located within the local government areas of Great Lakes, Dungog and Gloucester as identified in Figure 1.1. In accordance with the licence conditions issued for PEL 285 under Part 3 of the NSW *Petroleum (Onshore) Act 1991*, seismic surveys are classified as a Category 3 activity. A Category 3 activity requires the licence holder to notify the NSW Department of Industry and Investment (now the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS)) of that activity, and in most circumstances, submit an assessment of the activity in accordance with Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The REF describes the proposal, documents the potential impacts, and details protective measures to be implemented. It has been prepared pursuant to section 111 of the EP&A Act and clause 228 of the NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). Other relevant legislation has also been considered, including but not limited to the NSW *Threatened Species Conservation Act 1995* (TSC Act), NSW *National Parks and Wildlife Act 1974* (NPW Act), NSW *Protection of the Environment Operations Act 1997* (POEO Act) and the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF fulfils the requirements of section 111 of the EP&A Act, so that the responsible consent authority, in this case the DTIRIS can examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity in determining the proposal.

## 1.2 Site description

The seismic testing will be conducted across selected areas within PEL 285 in order to collate information about the hydrocarbon reserves in the licence area. In general, the survey will be limited to existing sealed roads, some unsealed roads, and grazing paddocks. The survey will be undertaken in the vicinity of Gloucester township in the north to Stroud Road in the south as identified in Figure 1.2. The areas subject to the survey will therefore be disturbed areas with minimal vegetation. As will be discussed in Chapter 2 the equipment used for the seismic survey requires cleared areas in which to operate, and therefore areas which are vegetated are problematic and avoided so that such areas are not part of the survey.

## 1.3 Zoning

The proposed seismic survey will be conducted over an area in which there are multiple zonings. The land use zonings of the proposed survey route cover both the Gloucester and Great Lakes local government areas (LGAs), and therefore two local environmental plans (LEPs) will apply to the proposed activities. The zonings that apply to the proposed survey are discussed further in Section 3.

It should be noted that under the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) the proposed survey, being petroleum exploration, is permitted without consent, although an REF is required due to the proposed activity being subject to Part 5 of the EP&A Act, in accordance with the requirements of the PEL.

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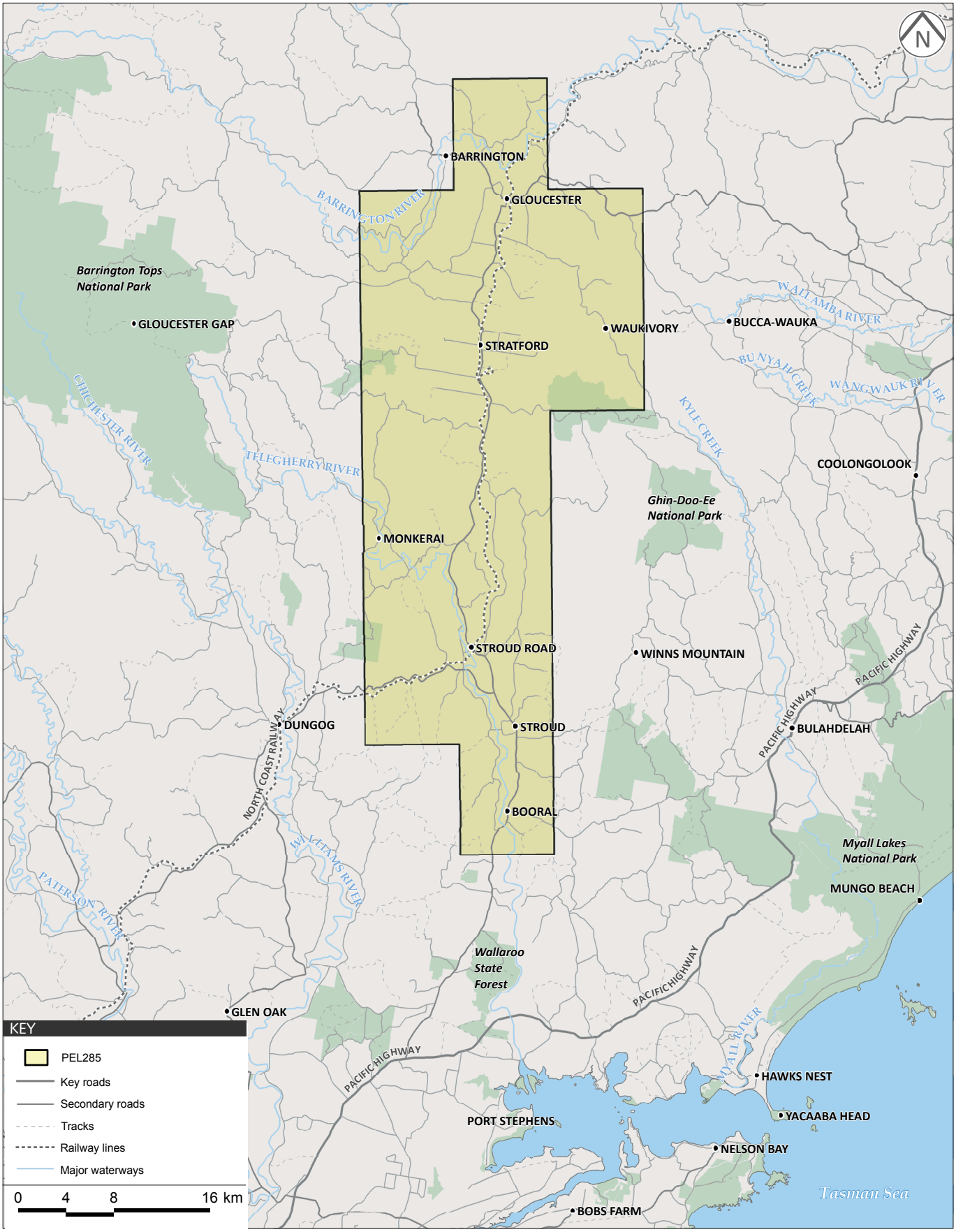


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PEL285

Proposed seismic survey

Figure 1.1

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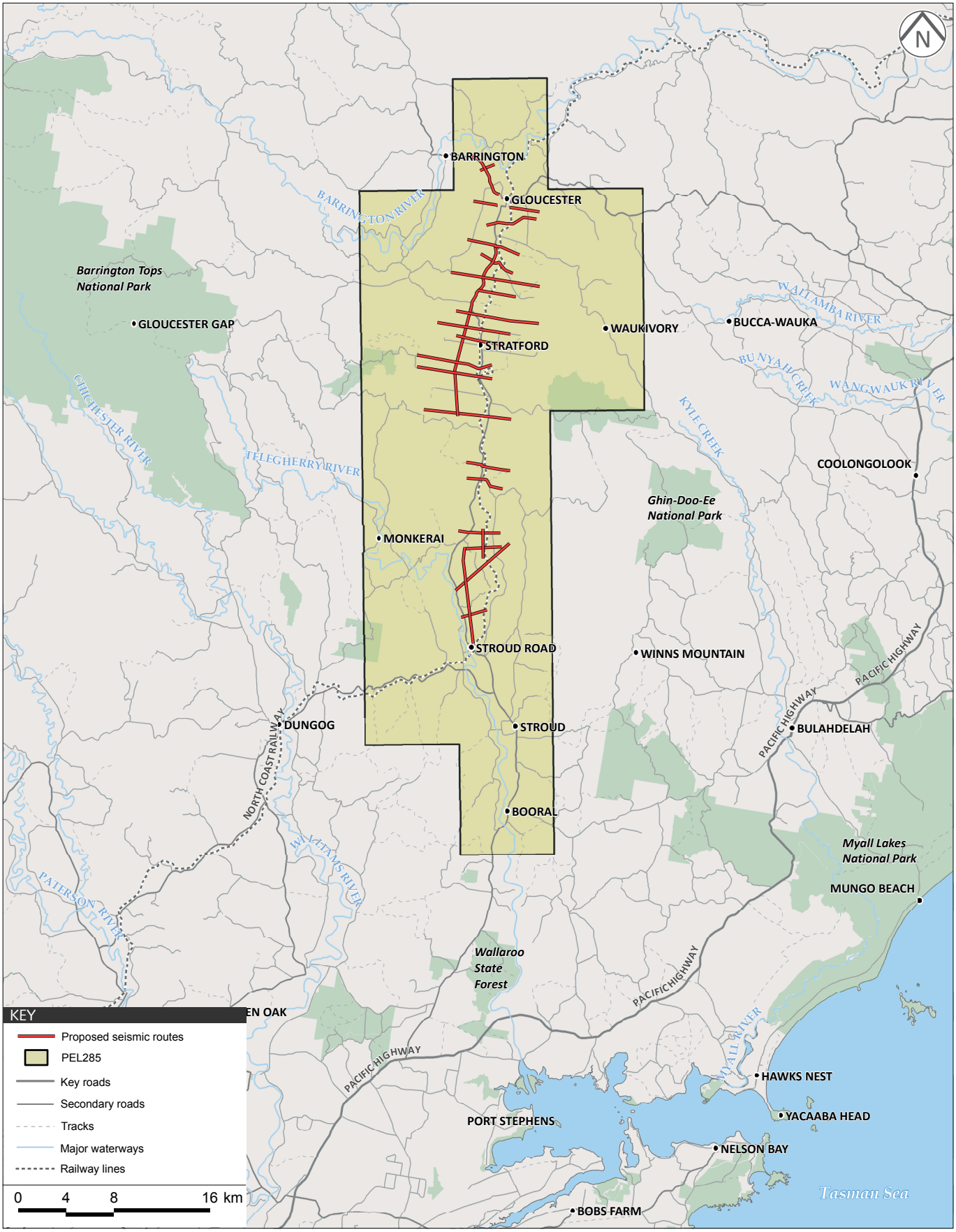


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Proposed seismic routes

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Proposed seismic survey

Figure 1.2

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## 1.4 Ownership

The seismic survey is predominantly being undertaken on existing roads within the PEL. The road network in the PEL is managed by the local Councils. Consultations have been conducted with Gloucester Shire Council and will be with Great Lakes Council in relation to the proposed survey. Consultations will occur with the Council as a road occupancy licence will be required to undertake the survey**.** Where any private property is being accessed the landholder's permission to undertake the proposed works is being negotiated by AGL.

## 1.5 Overview of PEL 285

PEL 285 was granted in 1992 under the NSW *Petroleum (Onshore) Act 1991*. In 2008, AGL Energy acquired PEL 285 from the Lucas Energy and Molopo Joint Venture to become the sole operator. The licence enables investigation of the exploration of petroleum within the licence area (refer to Figure 1.1.). The Lucas-Molopo Joint Venture conducted a number of exploration activities which provide important background material to the present activities within the PEL.

## 1.6 Previous activities

Exploration activities within the Gloucester Basin have been occurring since the early 1970s, when Noranda Australia Ltd drilled over 300 wells in the Gloucester Basin in search of open cut coal deposits. From 1977 to 1983, BMI Mining Pty Ltd (BMI) and Esso Australia Pty Ltd (Esso) drilled approximately 990 open cut coal exploration holes in the basin. BMI and Esso also drilled four deep fully cored stratigraphic holes in the north of the basin in relation to CSG exploration activities. Three separate dedicated CSG drilling programs were also undertaken nearby by Pacific Power near Stratford in 1993, 1997 and 1999.

From 2004 to 2008, the Lucas-Molopo Joint Venture drilled a number of CSG evaluation wells and exploration wells throughout the Gloucester Basin, particularly in the vicinity of the townships of Stratford and Craven.

Since 2008 a number of exploration wells have been drilled, or are proposed to drilled, by AGL as part of the licence conditions of the PEL. In late 2009 and early 2010 AGL also conducted a 2D and 3D seismic survey in selected areas of the PEL. The survey included:

- A 2D survey comprising 13 seismic lines across a total area of approximately 78 km; and
- A 3D seismic survey comprising a seismic pattern using a 64 m spacing grid over approximately 5,000 ha (5% of PEL).

## 1.7 Gloucester Gas Project

The proposed survey is within PEL 285 which is also commonly known as the Gloucester Gas Project (GGP). Planning approval of the GGP was approved by the Planning Assessment Commission (PAC) in February 2011 under Part 3A of the EP&A Act. While the seismic survey proposed is not part of the GGP that was approved under Part 3A of the EP&A Act, a number of environmental investigations were undertaken as part of this project and have been used as background material for this REF. In addition, exploration wells within the GGP are not covered by the Part 3A approval and as such are required to be considered under Part 5 of the EP&A Act.

The GGP is approximately 100 km north of Newcastle and is situated within PEL 285. The GGP primarily involves four integrated components:

- Gas Field Development Area (GFDA) – development of producing wells and associated infrastructure within the Concept Area and Stage 1 GFDA;
- Central Processing Facility (CPF) – compression of gas up to 30PJ per year with an 80 TJ/day average, water treatment facility including associated storage ponds, small scale ancillary power generation facility, and other ancillary infrastructure;
- Gas Transmission Pipeline (GTP) – high pressure gas pipeline from Stratford to Hexham; and
- Hexham Delivery Station (HDS) - custody transfer point for CSG from the pipeline to the Sydney Newcastle trunk pipeline.

Approval has been granted by the NSW PAC for:

- up to 110 well site locations within the Stage 1 GFDA of the Concept Area, including access roads, gas and water gathering system and other associated infrastructure;
- construction and operation of the CPF (up to 30 PJ per year with an average of 80 TJ per day) including a water treatment facility, storage ponds and an evaporation pond, 15 MW ancillary power generation facility and associated infrastructure within the Stage 1 GFDA;
- construction and operation of the gas pipeline from the CPF at Stratford to Hexham; and
- Hexham Delivery Station to transfer gas to market.

Gas from the GGP would produce at 20 to 30 PJ per annum, which is more than 10% of the existing NSW market. This represents the additional gas demand growth projected for the underlying NSW gas market over the next three to four years (excluding fuel for power generation). CSG from the GGP would be delivered into the existing NSW gas market through the pipeline connection into the existing Newcastle/Sydney gas network at Hexham.

## 1.8 Overview of proposed activities

The activity proposed includes a 2D seismic survey of comprising up to 23 seismic lines. This equates to approximately 130 km. No 3D seismic surveys are proposed as part of these works.

It is expected that the 2D survey will take approximately 4 - 6 weeks to complete. The proposed works are anticipated to begin in October 2011. On public land, the hours of operation will be:

- Monday to Friday 7 am - 6 pm;
- Saturday 8 am - 1 pm; and
- No construction work is to take place on Sundays or public holidays.

On private land the hours of operation will be in accordance with the access agreement between the proponent and the landholder.

## 1.9 Justification of the activity

The key objective in undertaking a seismic survey is to obtain a better understanding of the underlying geology of PEL 285. This understanding will assist in identifying and refining locations for coal seam gas extraction. Concept approval for the GGP has been granted by the PAC for CSG extraction in the PEL and

delivery of the gas to the Hexham delivery station as identified in Section 1.7 above. Part of the PEL (i.e. Stage 1) has also been issued with Project Approval for CSG extraction as identified in Section 1.7. The proposed works will allow a better understanding of the geology of the PEL in order to achieve the purposes of the planning approval and to refine future well locations to further minimise any potential environmental impacts. The seismic survey will inform the development of future applications within the approved concept area. The proposed survey will also assist in analysing soil stability, depth to bedrock and potential fault locations which are important in planning well locations and pipeline routes.

## 1.10 Evaluation of alternatives

Other surveying alternatives were considered in preparing this REF. This includes:

1. 'Do nothing' approach.
2. Investigations through drilling boreholes along proposed seismic routes. Geological information can be collated from drilling boreholes into the surface to depths up to at least 1 km, and collecting information via the boreholes.
3. Seismic reflection imaging using explosive shots. An alternative method to using the vibroseis truck is to use small explosive shots (ie blasting) to created seismic waves which are picked up by the geophones.

As described below in Section 2.1 the vibroseis method (truck mounted vibrator) is considered a low impact technique of undertaking seismic surveys instead of using explosive shots. The latter method has a number of issues, particularly noise and vibration. Due to the large area required for testing it is impractical to drill boreholes all over the PEL.

The 'do nothing' approach would result in unsatisfactory information regarding the geology of the PEL and therefore the outcomes of the planning approval and conditions of the PEL would be more difficult to achieve within the relevant timeframes.

## 1.11 Structure of the REF

This REF is structured in the following manner:

- Chapter 2 provides a detailed description of the proposed works including the plant and equipment used in the seismic survey as well as an understanding of the seismic imaging process;
- Chapter 3 identifies the planning and environmental legislation that applies to the proposed works;
- Chapter 4 provides an overview of the consultation undertaken as part of this REF;
- Chapter 5 assesses the potential environmental impacts of the proposed survey works and identifies mitigation options, if required;
- Chapter 6 presents a number of measures to ensure the survey works, when in operation, will continue to provide a safe and negligible impact on the environment; and
- Chapter 7 summarises the findings of the REF identified as part of the environmental assessment as well as addressing clause 228 of the EP&A Regulations.

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# 2 Proposed activities

## 2.1 Seismic reflection imaging

The 2D seismic survey proposes to utilise the method known as 'seismic reflection imaging' or 'seismic reflection profiling'. This method is based on the principle that acoustic energy (ie sound waves) will bounce, or 'reflect', off the interfaces between layers within the earth's subsurface. The sound waves bounce off the boundaries between different rock types which are collected by receivers and recorded to produce an image (or profile) of subsurface structures and layers.

Areas of structural deformation, such as fractures, can also be observed using seismic reflection. A fractured rock surface produces different reflections than a continuous rock surface. Identifying diffracted energy patterns is one way in which geologic structures such as faults can be mapped.

On land, a seismic vibrator 'pad' propagates energy signals into the Earth. This vibrator 'pad' can be attached to a small truck or can be a portable device similar to a compactor used on construction sites. The vibrator 'pad' is lowered to the ground and vibrated for approximately 10 seconds. During a seismic reflection survey the energy waves created by the vibrating 'pad' are recorded by a high-speed digital data recording system and acoustic sensors (geophones). Once the data is recorded it can be processed by geophysicists to produce profiles of the Earth's subsurface, which can be interpreted for hydrocarbon reserves.

## 2.2 Equipment

As part of this project AGL is proposing to use up to three different pieces of equipment to create the energy waves. The description of each of these available methods of creating energy waves are provided below:

- a truck mounted seismic vibrator (sometimes referred to as the 'vibroseis' truck or 'Envirovibe' truck);
    - the Envirovibe truck is a seismic unit mounted on a tractor sized buggy with an under-mounted vibrating plate that is lowered to the ground and vibrated for approximately 10 seconds; or
- a small light weight tracked vehicle which is mounted with a seismic vibrator (the onSEIS vehicle);
    - the onSEIS truck is a slightly smaller vehicle on tracks, not wheels, that is more agile and can access more difficult terrain. It also has an under-mounted vibrating plate; or
- a portable, hand operated surface compactor similar to those used on construction sites (mini-Sosie).
    - the mini-Sosie is a light and portable device allowing operations in more rugged terrain. The mini-Sosie uses a conventional road impactor as the energy source and employs a real time stacking algorithm to generate the seismic record. The mini-Sosie is effective on most surfaces and produces minimal surface disturbance.

To record the returning energy waves, a small portable instrument known as a geophone converts the data into a readable, analog signal. Before, the energy waves are generated, a survey team lays out the

geophones that are held to the ground by a peg approximately 75 mm in length. The geophones are connected by cables to a recording truck. Typically, between 5 and 8 km of the survey can be recorded each day. These geophones and cables are then collected.

The truck mounted seismic units move along the route of the seismic line (ie parallel to the geophones), generating seismic waves at regular intervals (between 10 and 50 m), which are recorded by each geophone receiver. The path or seismic line (including geophone locations) is surveyed using a global positioning system (GPS) or qualified land surveyors.

The trucks and mini-Sosie proposed for the survey are classified as a low environmental impact compared to traditional seismic testing procedures (eg blasting) and are optimised for operation in populated areas. The proposed survey method includes high fidelity and broadband width, low source generated ground pressure, low vehicle generated ground pressure and sound limiting systems.

Figures 2.1 to 2.3 present photos of the different pieces of equipment that may potentially be used such as a truck mounted seismic vibrator, a recording truck and a cable and geophone (receiver) network. Figure 2.4 presents a photo of the geophone receivers.

**Figure 2.1 An example of the Envirovibe truck (Source: AGL Fact Sheet, 2011)**


**Figure 2.2** An example of the onSEIS truck (Source: http://www.pnronline.com.au)


**Figure 2.3** An example of the mini-Sosie (Source: www.pscnewcastle.com.au)

**Figure 2.4 Geophone and cabling (Source: AGL Fact Sheet, 2011)**

## 2.3 Seismic reflection imaging and assessing environmental impact

### 2.3.1 Disturbance

Vegetation including grasses prohibits the use of the methodology proposed to be utilised for these survey works as it creates interference with the sound waves. The survey path needs to be visible to ensure safety and reduce the wind noise that may be picked up by the geophones. As such, in some instances some slashing of grasses and small shrubs may be required in order to conduct the survey.

The proposed seismic routes have been selected so that there is minimal ground disturbance. The advantage of the truck mounted seismic vibrator is that the truck can be manoeuvred to ensure that no trees have to be removed. The truck can also drive in relatively narrow areas. In addition, the truck mounted system also enables stretches of cleared areas (ie road reserves) to be surveyed while avoiding areas comprising significant vegetation. The slash area for the proposed works would only need to be 1.2 m wide for the geophone receivers and 2.5 m wide for the trucks. Therefore, up to 3.7 m may need to be slashed if the trucks need to move in parallel with the geophones. Any slashing activity would be undertaken in consultation with the relevant landowner.

Should any logs or other debris be encountered on the survey route, these items would be moved aside for the duration of the survey, and then returned to its original location upon completion.

### 2.3.2 Watercourses

Due to the manoeuvrability of the trucks used for the seismic survey no major watercourses, including creeks or rivers, need to be traversed (see Figure 1.2). As the survey will be generally confined to existing roads and unsealed tracks it is unlikely that watercourses will need to be traversed. If a watercourse is encountered, however, the geophone receivers can be laid up to the edge of watercourse and then cable laid across to the opposite side of the watercourse where the geophones can continue. The trucks and

other vehicles will travel to the opposite side of any river or creek using existing routes and continue the survey without crossing any watercourse where a suitable established crossing does not already exist.

## 2.4 Activity duration and working times

The seismic survey is proposed to be undertaken during the day time with no night time surveys proposed.

The OEH Interim Construction Noise Guidelines (ICNG) suggests the following time restriction for construction activities where the noise is audible at residential premises:

- Monday to Friday 7 am - 6 pm;
- Saturday 8 am - 1 pm; and
- No construction work is to take place on Sundays or public holidays.

These time restrictions are the primary management tool of the ICNG. The proposed seismic surveys will be carried out 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work will take place on Sunday or public holidays.

It is anticipated that the seismic survey will cover, on average, 6 km per day. As such, the survey will not impact on any residence for a significant length of time.

## 2.5 Workforce

The crew size for the seismic will be approximately 20 persons. In addition there may be between 4 to 8 land surveyors on site at any one time to obtain and mark the geographical coordinates of the geophones.

## 2.6 Environmental management

The GGP has an existing environmental management plan (EMP), which acts as an overarching document managing and monitoring the GGP's environmental interactions. It is proposed that the activities associated with the proposed works would be incorporated into this existing EMP. This EMP is provided in Appendix A and comprises the following aspects:

- produced water management;
- soil and ground stability;
- vegetation management;
- bushfire protection;
- air emissions;
- noise and vibration;
- clearing and grading;
- drilling, perforation and fracture stimulation;
- pond construction;

- trenching;
- cultural heritage;
- community and social impact;
- waste management;
- fuel and chemical storage and spills;
- pipe stringing and welding;
- pipe laying and backfilling;
- hydrotesting; and
- clean up and rehabilitation.

The EMP would be implemented for the proposed works and be supplemented by any mitigation or management methods identified in this REF.

# 3 Planning and statutory context

## 3.1 Petroleum (Onshore) Act 1991

The NSW *Petroleum (Onshore) Act 1991* regulates the search for onshore production and extraction of petroleum (ie oil and gas) in NSW. It creates exploration and production titles and also addresses environmental protection, royalties and compensation. The NSW *Petroleum (Onshore) Regulation 2007* requires all exploration or other activity carried out under the authority of a petroleum title to be carried out in conformity with the schedule published by the DII.

Under this Act the definition of 'petroleum' includes any naturally occurring hydrocarbon, whether in a gaseous, liquid or solid state, but specifically *does not* include coal or oil shale. Methane (the major component of CSG is a gaseous hydrocarbon, and therefore CSG is defined as a petroleum activity under this Act.

Before undertaking any activities, companies or individuals wishing to explore for coal seam gas in NSW must first apply to the Minister for Mineral Resources for a licence issued under the NSW *Petroleum (Onshore) Act*.

There are three main types of permits issued under the NSW *Petroleum (Onshore) Act*:

- PEL;
- Petroleum Assessment Lease (PAL); and
- Petroleum Production Lease (PPL).

As previously stated, AGL has been issued PEL 285 under the provisions of the NSW *Petroleum (Onshore) Act 1991*. To ensure environmental protection, operators apply for permission to operate by submitting an REF to DTIRIS. The REF describes how the operator would manage identified risks relating to the environment.

### 3.1.1 Petroleum Exploration Licence No 285

The proposed seismic survey would be undertaken in accordance with the provisions of PEL 285, which is held by AGL. Under the provisions of the PEL a seismic survey is classified as a Category 3 activity under the PEL. Condition 1 of the Second Schedule states that:

> *The type of activity listed in Category 3 requires notification to an Environmental Officer of the Department and will normally require an additional specific determination under Part 5 of the Environmental planning and Assessment Act, 1979. At least 4 weeks prior to the proposed commencement of any activity listed in Category 3, a Review of Environmental factors in accord with Clause 228 of the Environmental Planning and Assessment Regulation 2000 must be submitted to the Department to enable determination under Part 5 of the Environmental Planning and Assessment Act, 1979 to be made.*

## 3.2 Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulations 2000

The EP&A Act provides the legislative requirements and processes for any development (infrastructure, residential, industrial etc) in NSW. Any development in NSW is determined in accordance with the provisions of Part 4 or Part 5 of the EP&A Act. Under the provisions of section 76 of the EP&A Act and the Mining SEPP, Part 5 of the EP&A Act will apply to the proposed seismic survey as identified in the PEL.

Under section 111 of the EP&A Act, AGL is required to consider the potential environmental impacts of any activity before DTIRIS determine whether or not the activity can proceed. The potential environmental impacts of a proposal are, generally, identified within an REF. Under section 112, if the REF identifies that the proposed activity would have a significant environmental impact then an Environmental Impact Statement (EIS) is required to be prepared.

In addition, clause 228 of the EP&A Regulation identifies a series of 'factors' which must be considered when an REF is being prepared. These factors have been considered in preparing this REF. A summary of the aspects addressed in this REF with reference to clause 228 of the EP&A Regulation is provided in Section 7.3.

## 3.3 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The aims of this SEPP are:

a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and

b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and

c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.

Under clause 6 of the Mining SEPP development for any of the following purposes may be carried out without development consent:

a) mineral exploration and fossicking,

b) rehabilitation, by or on behalf of a public authority, of an abandoned mine site,

c) mining within a mineral claims district pursuant to a mineral claim under the NSW Mining Act 1992,

d) petroleum exploration,

e) the construction, maintenance or use (in each case, outside an environmentally sensitive area of State significance) of any pollution control works or pollution control equipment required as a result of the variation of a licence under the NSW *Protection of the Environment Operations Act 1997*, being a licence that applies to an extractive industry, mine or petroleum production facility in existence immediately before the commencement of this clause.

Although petroleum exploration activities (ie seismic surveys) are identified as development which does not require consent, this does not preclude an REF or EIS from being prepared as a result of the provisions of section 76 of the EP&A Act. Section 76(2) of the EP&A Act notes that, only where an environmental planning instrument identifies a development to be 'exempt' does Part 5 of the EP&A Act not apply. As the proposed seismic survey is *not* identified as 'exempt' then Part 5 of the EP&A Act will still apply.

## 3.4 State Environmental Planning Policy (Infrastructure) 2007

The aim of this SEPP is to facilitate the effective delivery of infrastructure across NSW. The SEPP is divided into a number of Divisions which allow works on, or on behalf, of a public authority to be carried in relation to electricity, gas, water and sewer, telecommunications, roads, airports, hospitals, railways, educational establishments, correctional centres, and the like. Division 9 applies to gas pipelines which are licensed under the NSW *Pipelines Act 1967* and NSW *Gas Supply Act 1996*, however, this SEPP does not apply to the proposed survey.

## 3.5 State Environmental Planning Policy No. 55 (Remediation of Land) 1998

The objective of this SEPP is to provide for a State-wide planning approach to the remediation of contaminated land. In particular, this SEPP aims to promote the remediation of contaminated land:

a) by specifying when consent is required, and when it is not required, for a remediation work, and

b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and

c) by requiring that a remediation work meet certain standards and notification requirements.

No contamination has been identified on the proposed routes. The seismic survey will be conducted on existing roads and unsealed tracks. Some minor slashing of grasses is proposed, however, it is considered that these works would not result in any contamination of the land as identified under this SEPP. Therefore, it is considered that a Phase 1 Environmental Site Assessment is not required or warranted for the survey.

Nonetheless, if any contaminants are found during any surveying works it would be necessary to inform the landholder, who can have the site assessed by a site contamination consultant.

## 3.6 Protection of the Environment Operations Act 1997

The POEO Act aims to protect and reduce degradation of the environment from development activities. The POEO Act examines issues such as air and water pollution, waste management and noise. The POEO Act also prescribes 'scheduled activities' in which a license must be obtained from the OEH. These 'scheduled activities' include industrial, mining, petroleum and agricultural developments of a certain size. Clause 5 and Schedule 1 of the POEO Act identify works that are considered to be a 'scheduled activity'. For petroleum works this includes activities which:

1. produce, other than in the course of exploratory activities, crude or shale oil, or

2. produce more than five petajoules (PJ) per year of natural gas or methane, or

3. refine crude petroleum, shale oil or natural gas, or

4. manufacture more than 100 tonnes per year of petroleum products (including aviation fuel, petrol, kerosene, mineral turpentine, fuel oils, lubricants, wax, bitumen, liquefied gas and the precursors to petrochemicals such as acetylene, ethylene, toluene and xylene), or

5. store petroleum and natural gas products with an intended storage capacity in excess of:

6. 200 tonnes of liquefied gases, or

7. 2,000 tonnes of any petroleum products, or

8. dispose of oil waste or petroleum waste or process or recover more than 20 tonnes of oil waste or petroleum waste per year.

The proposed seismic survey is not identified as a 'scheduled activity' and therefore does not require the proponent to obtain an environmental protection licence from OEH.

## 3.7 Threatened Species Conservation Act 1995

The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The objectives of the TSC Act are:

- to conserve biological diversity and promote ecologically sustainable development (ESD), and
- to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and
- to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and
- to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and
- to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and
- to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

In general, the TSC Act provides for the identification, and classification, of threatened species, populations and ecological communities. It also provides for the identification of key threatening processes that are most likely to jeopardise the survival of those species, populations and ecological communities.

The TSC Act also contains provisions about species impact statements. These statements are prepared to measure the significance of the effect of actions on threatened species, populations or ecological communities, or their habitats. A species impact statement must be lodged with an application for a licence under this Act if the Director-General determines that the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

If the action proposed to be taken by the applicant is not on land that is critical habitat and the application is not accompanied by a species impact statement, the Director-General must determine

whether the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

An assessment of the impact on flora and fauna has been prepared for the proposed survey which is discussed in more detail in Section 5 and Appendix C. The assessment identifies that the proposed works will have no impact on any threatened flora or fauna, however identified potential sensitive areas where slashing will occur, will require a walkover by a qualified ecologist prior to commencement of the slashing (refer to Figure C.1).

## 3.8 National Parks and Wildlife Act 1974

The objectives of the NPW Act include:

a) the conservation of nature, including, but not limited to, the conservation of:

   i) habitat, ecosystems and ecosystem processes, and

   ii) biological diversity at the community, species and genetic levels, and

   iii) landforms of significance, including geological features and processes, and

   iv) landscapes and natural features of significance including wilderness and wild rivers,

b) the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:

   i) places, objects and features of significance to Aboriginal people, and

   ii) places of social value to the people of NSW, and

   iii) places of historic, architectural or scientific significance,

c) fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation,

d) providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation.

In general the NPW Act seeks to conserve areas of significant biological diversity (eg National Parks, Nature reserves etc). Under the NPW Act it is an offence to harm threatened species or endangered ecological communities. In addition, the NPW Act also protects Aboriginal areas and items. It is also an offence under the NPW Act to disturb or destroy an Aboriginal object, without the consent of the Director-General.

In relation to the proposed survey works, an assessment of flora and fauna assessment has been prepared which identifies that no threatened species or endangered ecological communities would be disturbed by the proposed works, if the recommendations of this REF are followed (Section 5). An assessment of the impact of the proposed survey on Aboriginal archaeological was also prepared which concluded that the works are highly unlikely to disturb any items or areas of Aboriginal significance (Section 5). In the unlikely event that any items are identified during the work, the survey must immediately cease in the vicinity of the item and the OEH should be notified.

## 3.9 Heritage Act 1977

The NSW *Heritage Act 1977* aims to maintain items and areas of European heritage significance. The objectives of the Heritage Act are:

a) to promote an understanding of the State's heritage,

b) to encourage the conservation of the State's heritage,

c) to provide for the identification and registration of items of State heritage significance,

d) to provide for the interim protection of items of State heritage significance,

e) to encourage the adaptive reuse of items of State heritage significance,

f) to constitute the Heritage Council of NSW and confer on it functions relating to the State's heritage,

g) to assist owners with the conservation of items of State heritage significance.

A register must be maintained of all heritage items and areas of state significance. This register is called the State Heritage Register (SHR) and is administered by the Heritage Council.

Under the Heritage Act (ie section 139) it is an offence to disturb or excavate land that will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless an appropriate permit has been approved. A search of relevant heritage databases and Council's LEPs revealed that the works would not impact on any items or areas of heritage significance.

## 3.10 Water Management Act 2000 and Water Act 1912

The NSW *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:

a) to apply the principles of ecologically sustainable development, and

b) to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and

c) to recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:

   i) benefits to the environment, and

   i) benefits to urban communities, agriculture, fisheries, industry and recreation, and

   ii) benefits to culture and heritage, and

   iii) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water,

d) to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources,

e) to provide for the orderly, efficient and equitable sharing of water from water sources,

f) to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna,

g) to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,

i) to encourage best practice in the management and use of water.

The WM Act sets out principles for the management of water in NSW. The principles include:

a) water sources, floodplains and dependent ecosystems (including groundwater and wetlands) should be protected and restored and, where possible, land should not be degraded, and

b) habitats, animals and plants that benefit from water or are potentially affected by managed activities should be protected and (in the case of habitats) restored, and

c) the water quality of all water sources should be protected and, wherever possible, enhanced, and

d) the cumulative impacts of water management licences and approvals and other activities on water sources and their dependent ecosystems, should be considered and minimised, and

e) geographical and other features of indigenous significance should be protected, and

f) geographical and other features of major cultural, heritage or spiritual significance should be protected, and

g) the social and economic benefits to the community should be maximised, and

h) the principles of adaptive management should be applied, which should be responsive to monitoring and improvements in understanding of ecological water requirements.

The WM Act applies to those areas in NSW which are subject to Water Sharing Plans. Those areas not covered by a Water Sharing Plan are managed in accordance with the NSW *Water Act 1912.* There is no porous rock Water Sharing Plan in place for the Gloucester Basin at this time.

It is an offence under the WM Act to take water from a water source or interfere with an aquifer without an appropriate licence issued by the relevant authority. Even when a project is being undertaken by a local council or State agency requires an approval or licence is required under the NSW *Water Act 1912* or the WM Act. The proposed seismic survey will not intercept groundwater on any of the selected routes.

It should be noted that there are no streams or rivers that would be directly impacted by the proposed works (as discussed in Section 2).

## 3.11 Roads Act 1993

The NSW *Roads Act 1993* (Roads Act) is the key legislation in NSW for managing the public road network. The objectives of the Roads Act are:

(a) to set out the rights of members of the public to pass along public roads, and

(b) to set out the rights of persons who own land adjoining a public road to have access to the public road, and

(c) to establish the procedures for the opening and closing of a public road, and

(d) to provide for the classification of roads, and

(e) to provide for the declaration of the RTA and other public authorities as roads authorities for both classified and unclassified roads, and

(f) to confer certain functions (in particular, the function of carrying out road work) on the RTA and on other roads authorities, and

(g) to provide for the distribution of the functions conferred by this Act between the RTA and other roads authorities, and

(h) to regulate the carrying out of various activities on public roads.

Under Section 138 of the Roads Act, no work can be undertaken on a public road, or a structure developed on a public road, with the consent or concurrence of the RTA. If consent is required for works on a public road a "road occupancy licence" is required to be obtained from the RTA or local Council. A traffic control plan (TCP) is also required as part of the licence.

The proposed survey works will be conducted on a number of public roads. As such, the contractor undertaking the survey works will be required to obtain a road occupancy licence.

## 3.12 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance (NES) as well as Commonwealth land and actions by Commonwealth agencies. The EPBC Act focuses Commonwealth Government interests on the protection of matters of NES, with the states and territories having responsibility for matters of state and local significance. The objectives of the EPBC Act are to:

- provide for the protection of the environment, especially matters of national environmental significance;
- conserve Australian biodiversity;
- provide a streamlined national environmental assessment and approvals process;
- enhance the protection and management of important natural and cultural places;
- control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife; and
- promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.

The eight matters of NES to which the EPBC Act applies are:

- world heritage sites;
- national heritage places;
- wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed);
- nationally listed threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park; and
- nuclear actions.

Matters which are likely to have a significant impact on any of the matters of NES or on Commonwealth land must be referred to the Minister for Sustainability, Environment, Water, Population and Communities for a determination as to whether or not they are a controlled action which requires approval under the EPBC Act.

This Review of Environmental Factors has considered the impact of the proposed survey on each of the matters protected by the EPBC Act. The only matters protected by the EPBC Act which have the potential to be impacted by the proposed survey are listed threatened species and ecological communities. The Ecological Impact Assessment carried out as part of this Review of Environmental Factors concluded that, whilst a protected matters search indicating that a number of listed threatened species may or are likely to occur within the area of the PEL, the carrying out of the proposed survey is unlikely to have a significant impact on listed threatened species with potential to occur within the locality provided the recommended mitigation measures are implemented. Accordingly, the proposed works do not need to be referred under the EPBC Act.

## 3.13 Native Title Act 1993

The Commonwealth *Native Title Act 1993* provides for the recognition and protection of native title. A search of the National Native Title Tribunal website identified that there are no known native title claims over the land within the areas proposed for works.

## 3.14 Local environmental plans

The proposed survey routes are located within the Gloucester LGA and Great Lakes LGA. As such there are a number of zones that apply to the survey routes. The proposed survey routes in Gloucester are subject to the provisions of the Gloucester local environmental plan (LEP) 2010, while in Great Lakes are subject to the Great Lakes LEP 1996. There is no definition of exploration activities or any other definition that may apply to the proposed works within the Gloucester LEP or Great Lakes LEP. As such, the proposed works are not permitted with consent and are not prohibited under the LEPs. Nonetheless, the Mining, Petroleum Production and Extractive Industries SEPP over-rides the LEPs, which permits exploration activities in all zones without consent.

## 3.15 Ecologically sustainable development

Legislation in NSW is consistent with the principles of ESD. The most common definition of ESD emerged from the 1987 Brundtland Report, introduced by the World Commission on Environment and Development (WCED). The WCED define ESD as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

In NSW, Section 6(2) of the *Protection of the Environment Administration Act 1991* notes that ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. The Act goes on to note that ecologically sustainable development can be achieved through the implementation of the following principles and programs:

a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

b) in the application of the precautionary principle, public and private decisions should be guided by:

   i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

   i) an assessment of the risk-weighted consequences of various options,

c) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

d) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

e) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:

   i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

   i) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

   ii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Schedule 2 of the EP&A Regulations also identifies that consideration should be afforded to ESD in preparing environmental impact statements. The principles of ESD have been considered in the preparation of this REF. The principles would also need to be considered during the seismic survey.

## 3.16 Other legislation and guidelines

Other legislation was considered in the preparation of this REF, but was identified as not applying to the proposed survey. This includes the *Fisheries Management Act 1994, Coastal Protection Act 1979, Forestry Act 1916* and the *Wilderness Act 1987*.

The Department of Primary Industries (2006) Guidelines for Review of Environmental Factors, was also considered in preparing this REF.

## 3.17 Environmental licences and permits

The table below identifies a number of pieces of State and Commonwealth legislation and whether a permit is required under that Act or Regulation for the proposed development. The table below excludes any requirements under the EP&A Act, or EP&A Regulation.

**Table 3.1 Licence and permit requirements**

| Relevant legislation where a permit may be required | Permit/Concurrence required |
|---|---|
| Coastal Protection Act 1979 and Regulation 2004 | No |
| Protection of the Environment Operations Act 1997 | No |
| Water Act 1912 | No |
| Threatened Species Conservation Act 1995 | No |
| Fisheries Management Act 1994 | No |
| National Parks and Wildlife Act 1974 | No |
| Forestry Act 1916 | No |
| Wilderness Act 1987 | No |
| Heritage Act 1977 | No |
| Native Vegetation Act 2003 | No |
| Roads Act 1993 | Yes |
| Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 | No |
| Commonwealth Native Title Act 1993 | No |

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# 4 Stakeholder and community consultation

## 4.1 Background

Stakeholder consultation has been undertaken by the proponent for the purposes of this REF. Private landholders directly affected by the proposal have been consulted, and access arrangements with relevant landholders are being negotiated. The seismic survey will be carried out in accordance with the requirements of PEL 285 and the NSW *Petroleum (Onshore) Act 1991*. AGL also proposes to notify residents along the survey route up to three weeks prior to undertaking the seismic survey.

The proponent continues to maintain an open and ongoing communication with the local community about its present and future projects. Communications with the public are maintained through AGL's GGP website, as well as the GGP Community Consultative Committee (CCC).

Extensive community consultation for the Part 3A environmental assessment of the GGP began in February 2008 to ensure community views were captured, and incorporated into the environmental assessment recently approved by the PAC. A variety of consultation techniques were implemented, and continue to be designed to enable information about the GGP to effectively reach target audiences.

The overall objective of community consultation for the GGP is to ensure clear, effective, open, two-way communication at all times by listening, recording and responding to issues. The approach so far has included distributing information to and interacting with the local community and landowners affected by the proposed development, and to obtain community feedback.

## 4.2 Community consultative committee

As part of the wider GGP a CCC was formed in September 2008 to provide a forum for discussion and exchange of information between the community, Government agencies and AGL. The CCC assists AGL in identifying project related local issues for consideration during the development, environmental, construction and operational phases of the any project within the GGP. It also acts as a communication link between AGL, the community and other stakeholders. The CCC includes representatives from the community, local Landcare Group, environmental groups, Gloucester, Great lakes, Dungog and Port Stephens Council's, as well as representatives from AGL. Minutes from the CCC meetings are also available to individuals on the GGP web site.

## 4.3 Consultation with government organisations

As discussed in Section 1, AGL has informed Gloucester Council regarding the activities to be undertaken as part of the proposed seismic survey within PEL285. The consultation included discussion regarding notification of residences in proximity to the activities as well as the requirement for obtaining a road occupancy permit from council (as the roads authority) under the Roads Act. AGL will also discuss these aspects of the activities with Great Lakes Council prior to the commencement of the survey.

In addition to councils, AGL has liaised with DTIRIS regarding the preparation of the REF, environmental aspects to be addressed within the document including the preparation of the assessment of significance, provided in Appendix C.

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# 5 Environmental Interactions

## 5.1 Landform and geology

The seismic survey will be conducted within the Gloucester Basin. The Gloucester geological basin straddles the Manning River Catchment to the north and the Karuah River Catchment to the south. The Avon River originates to the south west of Gloucester and joins the Gloucester River to the north of the township of Gloucester.

The southern part of the proposed survey route is within the Karuah River Catchment which begins to the south of Craven and flows southwards towards Port Stephens.

The landforms of the locality of Gloucester are guided by the geology of the Stroud-Gloucester Syncline and comprise ridges to the east and west, undulating low hills and flat land in the centre where the Avon River flows to the north. The lowest points in the area are on the Avon Rover floodplain at approximately 100 m RL.

The Gloucester Geological Basin is a synclinal structure formed by Permian consolidated sediments. The Permian Rocks display steep dips of up to 90° on the edge of the basin, dipping towards the north-south axis, and flattening towards the basin centre. They lay on a basement composed of Early and Late Carboniferous sedimentary and volcanic units that are part of the New England Fold Belt. The geology of the area comprises Quaternary sediments along the valley floor and Permian rocks along the flanks and over most of the catchment. Carboniferous volcanics form the major east and west ridgelines.

A summary of the stratigraphy of the area is presented in Table 5.1 below.

## 5.2 Climate

The regional climate in this part of the Upper Hunter is characterised by hot summers, averaging 27°C in January, with periods of humid, stormy conditions, while winters are cool to mild and dry with average temperatures of 6°C in July.

Meteorological data is collected at the Gloucester Post Office station. The average annual rainfall in the area is 950 mm per annum, while the average evaporation rate is 1,103 mm. Evaporation exceeds precipitation from August to January.

## Table 5.1 Summary of relevant stratigraphy

| Group | Sub-Group | Formation | Approx Thickness (m) | Coal Seams |
|---|---|---|---|---|
| Gloucester Coal Measures | Craven Sub-Group | Crowthers Road Conglomerate | 350 | |
| | | Leloma Formation or Woods Road | 585 | Linden<br>Marker M6, M7 ("JD Coals")<br>Bindaboo<br>Deards |
| | | Jilleon Formation or Bucketts Way | 175 | Cloverdale<br>Roseville<br>Marker M3, M8, M1 ("Tereel Coals" – Fairbairns Road) |
| | | Wards River Conglomerate | Varies | |
| | | Wenham Formation | 24 | Bowens Road (BR0-BR5)<br>Bowens Road Lower (BR6) |
| | Speldon Formation | | 77 | |
| | Avon Sub-Group | Dog Trap Creek Formation | 126 | Glenview<br>Marker 2 |
| | | Waukivory Creek Formation | 326 | Avon<br>Triple<br>Rombo<br>Glen Road<br>Valley View<br>Parkers Road |
| Dewrang Group | Mammy Johnsons Formation | | 300 | Mammy Johnsons |
| | Weismantel Formation | | 20 | Weismantel |
| | Duralie Road Formation | | 250 | |
| Unconformity | | | | |
| | Alum Mountain Volcanics | | | Clareval<br>Basal Coal Seam |

*Notes: 1.Source: AECOM (2009) Gloucester Gas Project Environmental Assessment, prepared for AGL.*

## 5.3 Ecology

### 5.3.1 Introduction

An ecological assessment of the proposed seismic survey was prepared for the REF. In particular the ecological assessment identified:

- the potential for endangered ecological communities, threatened species and/or their habitat listed under the TSC Act to occur within the area identified for the survey;
- the potential presence of any matters of NES listed under the EPBC Act; and
- any avoidance, management of mitigation options.

### 5.3.2 Methodology

The ecological assessment included:

- a review of available literature and ecological databases;
- an impact assessment to determine the likely effects of the works on the ecology of the site and locality, including desktop analysis of potential sensitive areas where slashing will occur utilising aerial photography and available vegetation mapping; and
- preparation of recommendations to mitigate impacts.

### 5.3.3 Existing environment

The proposed works will be confined to existing roads, unsealed tracks and open pasture, and as such the survey will be conducted within a highly modified environment that has largely been cleared of vegetation. None of the proposed roads or tracks is identified as being located in riparian areas. The lack of vegetation and therefore structural diversity also means that fauna habitat resources are extremely limited and in general the existing habitat would only be suitable to common species regularly found in disturbed areas.

### 5.3.4 Impact Assessment

#### i Species listed under the TSC Act

A search of the NSW Wildlife Atlas (Appendix B) maintained by OEH identified four flora species listed under the TSC Act within 1 km of the proposed works. The species recorded on the database are identified in Table 5.2 below. All of the threatened flora and fauna species recorded in the area is presented in Figure 5.1.

**Table 5.2 Threatened flora within one kilometre of the survey routes**

| Scientific Name | Common Name | Status | Number of Records | Last date sighted |
|---|---|---|---|---|
| Cynanchum elegans | White-flowered Wax Plant | E | 1 | 2002 |
| Eucalyptus glaucina | Slaty Red Gum | V | 1 | 1974 |
| Pomaderris queenslandica | Scant Pomaderris | E | 1 | 1897 |
| Asperula asthenes | Trailing Woodruff | V | 1 | 1897 |

The nearest recorded flora species to the proposed survey routes was the Trailing Woodruff which was recorded 350 m from a proposed survey route, and in 1897 according to the OEH database. The next flora species closest to the proposed routes was the Slaty Red Gum which was recorded approximately 720 m from a proposed route. Given the distance from the proposed routes, the localities selected from the survey (ie disturbed areas) and the minor nature of the activities (ie slashing), it is unlikely that the proposed works will impact on any threatened flora.

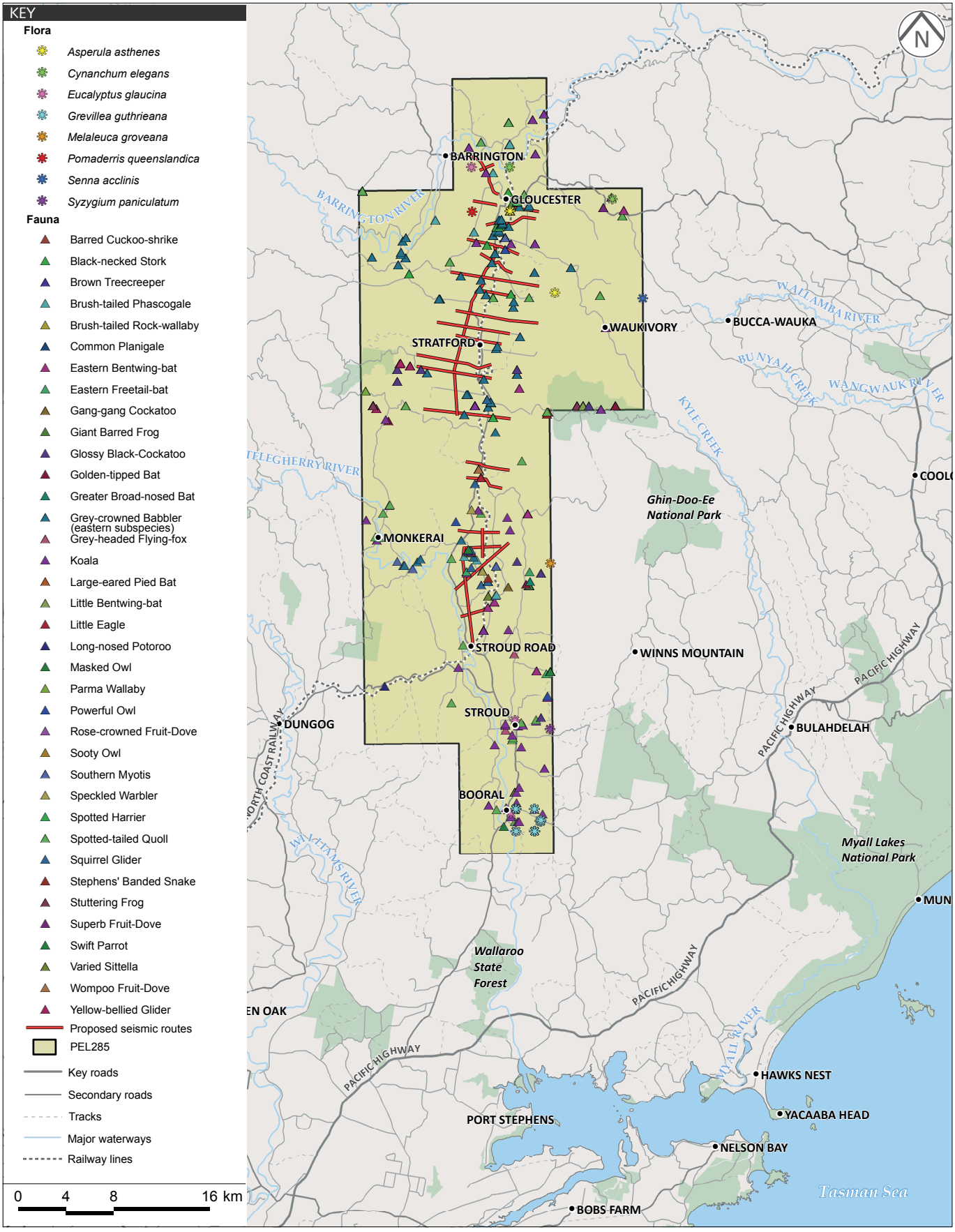
The NSW Wildlife Atlas was also searched to examine the potential impact the survey may have on threatened fauna. The search identified 85 records within 1 km of the proposed survey routes. Table 5.3 below identifies the threatened fauna recorded in the OEH database. A search was also conducted of fauna records within 5 km of the proposed routes. No additional species were identified outside of the State Conservation/Forest areas in the vicinity of the township of Gloucester.

**Table 5.3 Threatened fauna within one kilometre of the survey routes**

| Scientific Name | Common Name | Class | Status | Number of Records | Last Sighting |
|---|---|---|---|---|---|
| Ephippiorhynchus asiaticus | Black-necked Stork | Aves | E | 9 | 2006 |
| Climacteris picumnus | Brown Treecreeper | Aves | V | 1 | 2009 |
| Phascogale tapoatafa | Brush-Tailed Phascogale | Mammalia | V | 4 | 2009 |
| Miniopterus schreibersii oceanensis | Eastern Bentwing-bat | Mammalia | V | 3 | 2009 |
| Mormopterus norfolkensis | Eastern Freetail-bat | Mammalia | V | 3 | 2009 |
| Calyptorhynchus lathami | Glossy Black-Cockatoo | Aves | V | 1 | 2007 |
| Scoteanax rueppellii | Greater Broad-nosed Bat | Mammalia | V | 1 | 2003 |
| Pomatostomus temporalis temporalis | Grey-crowned Babbler (eastern subspecies) | Aves | V | 34 | 2010 |
| Phascolarctos cinereus | Koala | Mammalia | V | 8 | 2008 |
| Hieraaetus morphnoides | Little Eagle | Aves | V | 1 | 1992 |
| Ninox strenua | Powerful Owl | Aves | V | 2 | 1982 |
| Myotis macropus | Southern Myotis | Mammalia | V | 2 | 2009 |
| Pyrrholaemus saggitatus | Speckled Warbler | Aves | V | 5 | 2009 |
| Dasyurus maculatus | Spotted-tailed Quoll | Mammalia | V | 4 | 2006 |
| Petaurus norfolcensis | Squirrel Glider | Mammalia | V | 4 | 2007 |
| Lathamus discolor | Swift Parrot | Aves | E | 1 | 2008 |
| Ptilinopus magnificus | Wompoo Fruit-Dove | Aves | V | 1 | 1995 |
| Petaurus australis | Yellow-bellied Glider | Mammalia | V | 1 | 2003 |

The species with the largest number of records was the Grey Crowned Babbler which constituted 40% of all records. The only two endangered species identified were the Black Necked Stork and the Swift Parrot, which were last identified in 2006 and 2008, respectively. The Black Necked Stork inhabits wetland areas and marshes, while the preferred habitat of the Swift Parrot is forest and woodland communities. The critical factor in the decline of the Swift Parrot has been the removal of nesting hollows.

The proposed survey will be undertaken on existing roads, access tracks and cleared paddocks. It is unlikely that the habitat of any of the species listed as vulnerable under the TSC Act above will be affected by the proposal. The areas selected for the survey lack the complexity required to provide habitat for a range of threatened species as pasturelands generally have few refuge areas or foraging resources.

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Source: Office of Environment and Heritage (OEH) - July 2011

EMGA MitchellMcLennan

## Threatened species

Proposed seismic survey

Figure 5.1

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Road reserves in the area may provide nesting and foraging habitat for the Grey-crowned Babbler which is listed as vulnerable under the TSC Act. Previous studies in the area have identified the Grass Owl (*Tyto capensis)* as a species which may be impacted by works in cleared paddocks. It is considered that the Grass Owl is unlikely to be affected by the proposed works. This is because the Grass Owl is more often found in the north-east of NSW, but is found in areas of tall grass, tussocks in swamp areas and swampy heath, or sedges on flood plain. If any disturbance occurred to grassed and tussocky areas in paddocks this would be minimal and temporary. Substantial habitat areas remain within the locality and it is therefore highly unlikely that the Grass Owl would be adversely affected or placed at risk.

In general, habitat suitable for fauna would be limited to common species of native and introduced fauna found in disturbed areas such as the European Red Fox (Vulpes vulpes).

As discussed in Section 2, slashing is not expected to occur across all areas of the seismic survey. Where a watercourse is encountered no slashing will occur and the geophone receivers will be laid up to the edge of watercourse and then cable laid across to the opposite side of the watercourse where the geophones can continue. Vehicles will use existing crossings to travel to the opposite side of any river or creek and continue the survey without crossing any watercourse where a suitable established crossing does not already exist.

As described in Section 2.2 of the REF, the vehicles used for the proposed works are optimised for minimal impact and are flexible in terms of manoeuvrability. Where proposed routes have been identified as having potential to have sensitive vegetation no slashing will occur and there would be no requirements for an ecological survey or walk-over. However, if an area of sensitive vegetation has been identified where some slashing is required to undertake the seismic survey a pre-clearance survey by an ecologist will be required. Potential sensitive areas were identified through an analysis of the seismic routes, aerial photography and available vegetation mapping. These areas are shown in Figure C.1 in Appendix C.

It is concluded that the proposed works would not impact on any known breeding habitat for the species recorded under the TSC Act. It is also unlikely to have a significant impact on foraging resources, and with appropriate management options as identified in the sections below, it is unlikely that any of these species would be significantly impacted. Therefore, a Species Impact Statement is not required.

### ii Endangered Ecological Communities (EECs)

The subject sites are located with the Karuah Manning Catchment Management Authority (CMA). Investigations have identified 12 endangered ecological communities (EECs) as being listed within this CMA. None of the 12 listed EECs were identified as being impacted by the proposed survey.

### iii Commonwealth EPBC Act

A search of the EPBC Protected Matters Search Tool revealed that there a number of matters of NES which are located within the Gloucester and Great Lakes LGAs (Appendix B). Further assessment concluded that the only matters protected by the EPBC Act which have the potential to be impacted by the proposed survey are listed threatened species and ecological communities. The Ecological Impact Assessment carried out as part of this Review of Environmental Factors concluded that, whilst a protected matters search indicating that a number of listed threatened species may or are likely to occur within the area of the PEL, the carrying out of the proposed survey is unlikely to have a significant impact on listed threatened species with potential to occur within the locality provided the recommended mitigation measures are implemented. Accordingly, the proposed works do not need to be referred under the EPBC Act.

### iv Corridors and connectivity

The proposed works will be located on existing roads and unsealed tracks which have been previously cleared. Any vegetation that is within the verges or road reserves will be grasses or very low lying shrubs. The Avon and Gloucester Rivers would provide the strongest linkages in the area. The proposed survey this therefore unlikely to affect movement corridors and connectivity for any species of flora or fauna within the locality.

### v SEPP 44 – Koala Habitat Protection

An assessment of koala habitat under SEPP 44 was also prepared as Gloucester is a LGA listed under Schedule 1 of SEPP 44. The proposed survey route, including roads and tracks, could not be considered core koala habitat or potential koala habitat as the proposed routes lack trees and in particular those species listed under Schedule 2 of the SEPP. In the unlikely event a koala is encountered, the area will be avoided and not form part of the survey.

### vi Key threatening processes

It is unlikely that any key threatening processes listed under the TSC Act or EPBC Act would be exacerbated by this proposal as the proposed survey route has been located to avoid areas of native vegetation and riparian or seepage areas, and no native vegetation would be cleared or natural drainage patterns altered.

### vii Disturbance of fauna

Disturbance of fauna could occur as a result of increased noise levels from traffic. As the majority of the survey activities would be conducted on roads and tracks, which currently have existing traffic it is anticipated that this proposal would provide few risks to fauna. Appropriate mitigation measures have been put in place in the event that fauna pose a problem to the moving trucks, although this is unlikely given the trucks are slow moving vehicles.

### viii Priority actions

In the Gloucester LGA and Great Lakes LGA there are a number of priority actions identified as being 'high priority, which include actions that apply to threatened species, populations and communities, and key threatening processes. None of the activities of the proposal are inconsistent with any of the strategies or actions identified for this area.

### ix Assessment of significance

A number of ecological studies have been prepared for the PEL, including a study prepared for the approved GGP. Gloucester Council has also prepared a *Threatened Species Assessment* and *Grey Crowned Babbler Retention Plan*. AECOM prepared an REF[1] for previous seismic testing in the PEL. These studies have been considered in preparing this REF, and given that disturbance is limited to slashing where required, it is considered that the proposed works will not impact on any habitat for threatened species, or will there be any indirect impacts from the proposed works, provided that the mitigation measures outlined below are implemented. The methodology also considered an analysis of the proposed seismic routes to identify potential sensitive areas where slashing will occur that would require a walkover prior to commencement of the slashing. This analysis included assessment of the proposed seismic routes,

[1] AECOM (2009) *AGL Gloucester Seismic Survey REF*.

aerial photography and available vegetation mapping. An assessment of significance and the identified areas are provided in Appendix C.

#### x Cumulative impacts

The ecological assessment states that there is unlikely to be any cumulative impacts associated with the proposed works as native vegetation would not be removed, fauna habitat would not be altered and with appropriate management methods the hydrology of the site would not change and any impacts would be minor and temporary.

### 5.3.5 Mitigation measures

- The ecological assessment identified the following mitigation measures: in identified sensitive areas (refer to Figure C.1) which cannot be avoided and if some slashing is to occur, a pre-clearance survey will be undertaken by an experienced ecologist. The project ecologist will provide advice to the survey team to plan the seismic survey route to minimise potential impacts to these areas. If required, this survey will include:
    - the identification, marking and avoidance of threatened plants and bird nests;
    - a 10 m 'no slashing' buffer zone established around hollow-bearing trees to maintain groundcover and minimise potential impacts to resident fauna;
    - a 20 m 'no slashing' buffer zone established to maintain groundcover where owl or Glossy-black Cockatoo (*Calyptorhynchus lathami*) nest sites are identified;
    - woody ground debris moved by hand and replaced in original location under the supervision of the ecologist;
    - a 10 m 'no slashing' buffer zone established around identified threatened frog habitats; and
    - avoidance of areas of EEC.
- the environmental management plan will be updated to include:
    - on-site environmental management to advise contractors and other on-site personnel on ways of minimising ecological impacts. Personnel should be briefed on the importance of the Grey-crowned babbler and laminated photos of this species and its nests placed in each vehicle for identification;
    - traffic control measures will be required for the works. Slower speeds should be adhered to reduce the risk of fauna injuries;
    - measures to prevent the spread or introduction of weeds at all work sites;
    - rubbish management; and
    - management of any chemicals, fuels and wastes.

## 5.4 Aboriginal cultural heritage

### 5.4.1 Introduction

An assessment was conducted to identify the Aboriginal cultural heritage values pertaining to the specific areas to be impacted by the proposed seismic survey. Cultural heritage values may pertain to physical sites of Aboriginal objects, particular significant historical associations with the particular areas or socio-cultural values associated with Aboriginal tradition. The most commonly identified Aboriginal heritage values in assessments of this nature relate to the presence of Aboriginal objects.

### 5.4.2 Methodology

The methods employed to identify Aboriginal cultural heritage values included a review of records identified in the Aboriginal Heritage Information Management System (AHIMS) maintained by OEH and a review of the recent comprehensive Aboriginal heritage assessment conducted for the GGP by AECOM.

### 5.4.3 Background

The proposed impact areas occur on existing roads, highly disturbed paddocks, unsealed tracks (ie dirt tracks) or within the verges of these routes. The routes are predominantly subject to traffic. The routes of the proposed seismic survey have therefore been subject to significant disturbance over a number of years.

The Gloucester area was initially occupied by people of the Birpai language group, also known in the various literature as Biribay, Biribi, Birippi, Birrapee, Birripai, Birripi, Bripi, Brippai and Waw-wyper. According to Tindale (1974:192) this territory covered an area of some 7,300 km$^2$, extending from the Manning River at Taree south to Cape Hawke (near Forster) on the coast, and inland to the dividing range around Gloucester in the south west and the head of the Hastings River in the northwest.

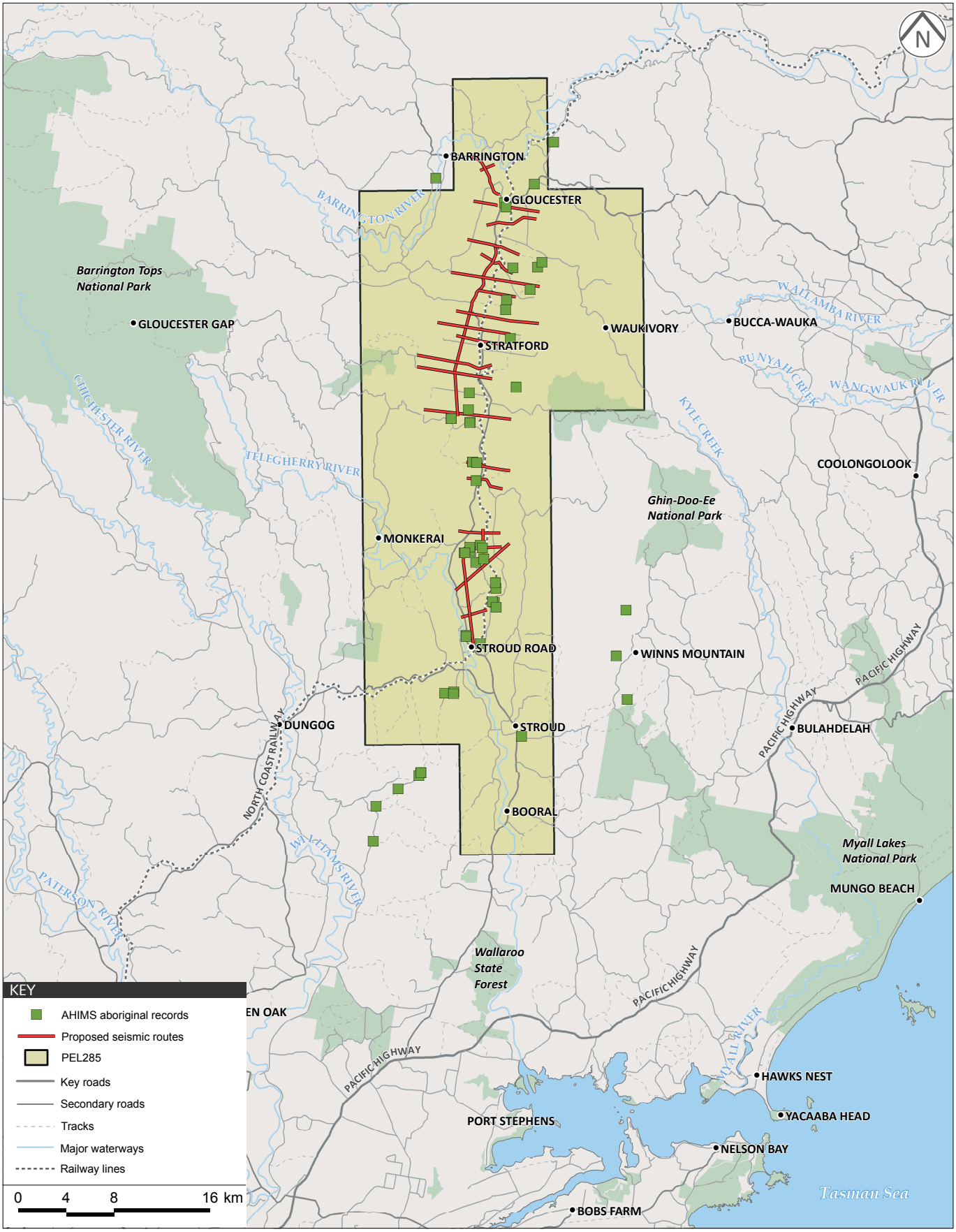
Archaeological investigations have been limited in the area to a few coal mine assessments and the recent AECOM assessment cited above. AECOM (2009) report that there have been few archaeological surveys conducted in the Gloucester region, with only a few open stone artefact sites comprising small numbers of flaked stone tools recorded. Such sites typically comprise flaked stone artefacts distributed within the topsoil, and therefore are readily hidden in a grassed paddock. Typically areas of intact ground within 50 m of a creek in the greater Hunter region are considered archaeologically sensitive based on the results of archaeological test excavations. Assessment of potential impact is therefore made on a predictive basis rather than on direct observation of open stone artefact sites.

Previous investigations by EMM in March 2011[2] with local Aboriginal elder Norma Fisher identified the preference for Aboriginal people in the past to move along the creeks and camp close to the creek bank areas near tea tree. The tea tree could be burned to produce smoke and discourage insects.

### 5.4.4 Impact assessment

No Aboriginal sites are identified as occurring within the proposed survey areas. There were 23 recorded sites on the AHIMS database within 1 km of the proposed routes. Of these eight were within 300 m of the proposed survey routes. The main area of potential impact is the area just north of Stroud Road near the Duralie Coal Mine. Of these eight recorded sites, four are in close proximity to the proposed survey routes which are identified in Table 5.4.

[2] EMM (2011) *Review of Environmental Factors Proposed Exploration Boreholes, Waukivory*.




Integrated Design Solutions | 030556 Rev B - 27 July 2011

Source: Office of Environment and Heritage (OEH) - July 2011

EMGA | MitchellMcLennan

# AHIMS Aboriginal Records

Proposed seismic survey

Figure 5.2

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**Table 5.4 Known Aboriginal heritage items in the vicinity of the survey routes**

| Site ID | Site Name | Site Features | Estimated Distance from Works |
|---|---|---|---|
| 38-1-0040 | DM3 Duralie Mine 3 | Modified Tree | 20m |
| 38-1-0043 | DM6 Duralie Mine 6 | Artefact | 80m |
| 38-1-0047 | DM10 Duralie Mine 10 | Modified Tree | 20m |
| 38-1-0046 | DM9 Duralie Mine 9 | Artefact | 80m |

It is considered that the proposed works will not impact on the two artefacts identified by previous archaeological studies. The two modified trees that are in close proximity are unlikely to be affected by the proposed survey works as long as the survey is conducted within cleared areas in the vicinity of identified archaeological items. To ensure the modified trees and artefacts are not disturbed during any works the construction contractor should be provided with the geographical coordinates of the items listed in Table 5.4, and a GPS system should be used during the works to avoid these items.

### 5.4.5 Legislative considerations

Aboriginal objects and Aboriginal places are protected by the NPW Act. Aboriginal sites are protected because they consist of Aboriginal objects. An Aboriginal place is defined in the Act as a place declared by the Minister that is or was of special significance with respect to Aboriginal culture. The Act includes a strict liability offence for harm to an Aboriginal object and provides significant penalties for individuals and corporation. An Aboriginal heritage Impact Permit (AHIP) must be obtained prior to harming Aboriginal objects. Applications to the OEH for an AHIP must show evidence of Aboriginal consultation in accordance with the National Parks and Wildlife Regulation 2009 and follow published guidelines. The location of Aboriginal objects must be notified to OEH in the prescribed manner.

### 5.4.6 Mitigation measures

Any items of known Aboriginal heritage should not be affected by the proposed works. In addition, no excavation works are proposed. To ensure the protection of Aboriginal heritage the following mitigation measures should be employed:

- all workers (including contractors) should be made aware that it is illegal to destroy an Aboriginal item or artefact under the NPW Act, and if it is considered that a potential Aboriginal item is uncovered during the survey, all work is to cease and OEH is to be contacted;
- the contractor should be provided with the geographical coordinates of the known Aboriginal items that may be impact by the proposed works (as identified in Table 5.4) to ensure these are not impacted;
- an appropriate buffer (ie 10 m) from known Aboriginal items should be instigated for the survey works;
- no excavation works are to be undertaken as part of the survey.

## 5.5 Surface water

### 5.5.1 Existing environment

As previously mentioned there are a number of watercourses that are in the vicinity of the proposed seismic survey. The major rivers that traverse the PEL are the Gloucester River, Karuah River, Wards River, Mammy Johnsons River and Avon River, while there a small number of tributaries and creeks, including, for example, Waukivory Creek, Dog Trap Creek, Cedar Creek, Spring Creek and Avondale Creek.

### 5.5.2 Impact assessment

The potential impacts on surface water of the survey works include the potential for increased erosion and sedimentation were vegetation may be disturbed and from fuel/chemical leaks from motor vehicles.

### 5.5.3 Mitigation measures

The proposed survey is transient and temporary in nature, does not involve ground disturbance, and the works will be conducted in already disturbed areas. It is therefore unlikely that there will be any significant increase in erosion or sedimentation due to the proposed works. Even if grasses are slashed, a covering of grass can still remain in place to ensure there are no erosion or sedimentation issues.

To ensure that any potential for fuel spills or leaks are minimised all vehicles should be maintained in accordance with the manufacturers specifications, and spill kits made available as part of the works.

## 5.6 Flooding

### 5.6.1 Existing Environment

There are a number of rivers and creeks in the PEL which are subject to flooding which include the Avon River, Gloucester River, Wards River, Mammy Johnsons River and Karuah River.

### 5.6.2 Impact assessment

A search was conducted of publicly available information regarding flood prone lands in Gloucester LGA and Great Lakes LGA. Gloucester LEP contains flood maps while Great Lakes Council has prepared a number of flood studies.

Two of the proposed survey routes just south of the township of Gloucester are within the 'flood planning area' as identified in Gloucester LEP. A flood planning area is the area of land below the flood planning level (1 in 100 year flood plus a 0.5 m freeboard) and thus subject to flood related development controls (refer to Appendix B).

An examination of publicly available flood studies prepared by Great Lakes Council identified that none of the proposed seismic routes in the Great Lakes LGA are subject to flooding.

There is not expected to be any major impact on the proposed routes as a result of flood activity.

### 5.6.3 Mitigation measures

The survey contractor should review weather forecasts prior to commencing works each day of the survey works to ensure the survey is not subject to flooding. The contractor should also ensure staff is aware of egress arrangements in case of a extreme storm.

## 5.7 Groundwater

### 5.7.1 Existing environment

Within the Gloucester Basin, three types of aquifers have been identified during previous investigations (SRK Consulting,2010). In order of depth this includes:

- shallow alluvial aquifer;
- shallow bedrock aquifer; and
- coal seam water bearing zones.

An investigation undertaken by AECOM stated that the shallow alluvial aquifer in the Gloucester Basin ranges from 2 m to 20 m deep. The water table is generally less than 5 m from surface. Latest information from the current investigations is that the shallow bedrock aquifer provides small supplies from depths around 75 m from surface and the depth to water is generally 20 m to 40 m from surface. In addition, the groundwater within coal seams is considered a very poor aquifer, and is generally confined and sub-artesian with most water coming from higher in the stratigraphic sequence (AECOM 2009). The primary aquifers across the catchment are the shallow alluvium associated with the major rivers and creek systems, and the shallow fractured bedrock to around 75 m depth.

The AECOM (2009) report notes that within the shallow alluvial aquifer groundwater is fresh to brackish and is suitable for domestic (non-potable) and livestock consumption and irrigation (at selected sites). Groundwater in the shallow bedrock aquifer is brackish to slightly saline while within the deep coal seam zones, groundwater is slightly to moderately saline and is unusable for most purposes. These results suggest that the groundwater gets more saline (due to longer residence times) with depth.

### 5.7.2 Impact assessment

The proposed works involve seismic reflection imaging techniques as discussed in Section 2. As such, the works are conducted on the surface, with no impacts below the surface. The geophones (receivers) have a small ‘spike’ which is placed into the ground to stabilise the geophones, but will not impact on groundwater aquifers in the area. It is not expected, therefore, that any works will impact on groundwater in the area.

### 5.7.3 Mitigation measures

No specific mitigation measures are proposed in relation to groundwater. Appropriate surface water controls as discussed earlier (Section 5.5) will ensure appropriate water management controls for the proposed works.

## 5.8 Noise and vibration

### 5.8.1 Noise

#### i Introduction

A noise and vibration review was undertaken by EMM for the proposed seismic surveys. The following aspects of the proposed works were considered with regards to noise:

- the noise generated by seismic testing; and
- potential management and mitigation strategies for the proposed works.

#### ii Assessment criteria

The OEH Interim Construction Noise Guidelines (ICNG) provides guidelines for the assessment and management of noise from construction works. The ICNG recommends a qualitative approach for relatively small scale projects such as this.

The noise exposure duration to receivers is likely to be less than 15 minutes at a time as the rig travels at approximately 2 km/hr, although the duration of the entire project is expected to occur for more than three weeks.

#### iii Noise management level

The ICNG suggests the following time restriction for construction activities where the noise is audible at residential premises:

- Monday to Friday 7 am - 6 pm;
- Saturday 8 am - 1 pm; and
- No construction work is to take place on Sundays or public holidays.

Table 5.5 is an extract from the ICNG and provides noise management levels for residential receivers for daytime and out of hours periods. These time restrictions are the primary management tool of the ICNG. The proposed seismic surveys will be carried out 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work will take place on Sunday or public holidays.

**Table 5.5 ICNG residential criteria**

| Time of Day | Management Level LAeq (15 min)* | How to Apply |
|---|---|---|
| Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays | Noise affected RBL + 10 dB | The noise affected level represents the point above which there may be some community reaction to noise.<br>Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>The proponent should also inform all potentially impacted residents of the nature of works to be |

**Table 5.5 ICNG residential criteria**

| Time of Day | Management Level LAeq (15 min)* | How to Apply |
|---|---|---|
| | | carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected 75 dB(A) | The highly noise affected level represents the point above which there may be strong community reaction to noise. |
| | | Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: |
| | | times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. |
| | | if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. |
| Outside recommended standard hours | Noise affected RBL + 5 dB | A strong justification would typically be required for works outside the recommended standard hours. |
| | | The proponent should apply all feasible and reasonable work practices to meet the noise affected level. |
| | | Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. |
| | | For guidance on negotiating agreements see section 7.2.2. |

In summary, the ICNG noise level goals for activities during the standard hours are 10 dB above the existing background levels. For activities outside of the above hours the noise levels should be no more than 5 dB above the existing background levels.

As there is no existing background noise level data at the numerous surrounding sensitive residences, this assessment adopted a conservative approach of setting a background noise level typical of rural environments of 30 dB(A). This approach is consistent with the guidelines of OEH's Industrial Noise Policy (INP). The residential construction noise criteria for the proposal are therefore provided in Table 5.6.

**Table 5.6 Residential construction noise criteria**

| Location | $L_{Aeq, 15min}$ Noise Criterion, dB(A) |
|---|---|
| Residential Assessment Locations | 40, ie background plus 10 dB (recommended hours) |
| | 35, ie background plus 5 dB (out of hours) |

#### iv Typical noise levels

Noise specifications of the 'onSEIS' seismic plant identified an operational sound power level of 99 dB(A) (as supplied by AGL). This equates to a received noise level of 65 dB(A) and 40 dB(A) at 20 m and 350 m respectively. It should be noted that the speed of the plant is approximately 2 km/hr and therefore the duration of exposure from seismic plant operations at any one location (at full capacity) is expected to be significantly less than 15 minutes.

The noise from proposed seismic testing is expected to be below the ICNG's highly affected criteria of 75 dB(A) at all locations.

Two alternative methods of seismic testing may also be used and include the Mini-Sosie and Envirovibes units. These units have not been assessed in detail within the assessment. These methods would generate less noise and vibration compared to the 'on-Sosie' unit, therefore where the 'on-Sosie' unit demonstrates compliance the two alternative methods are expected to meet compliance also.

### 5.8.2 Vibration

A review of potential vibration was undertaken by EMM for the proposed seismic surveys.

#### i Human comfort – Assessing vibration a technical guideline

Human comfort levels have not been quantified in this assessment due to the short duration of exposure to receivers along the proposed testing route. Generally, there is a very low probability of adverse disturbance to building occupants for seismic testing for distances of up to 20 m.

#### ii Structural damage criteria

For structural damage, vibration should be assessed at the foundation of a building structure. In the absence of a relevant Australian Standard, the German Standard DIN 4150 - Part 3: 1999 provides the strictest guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally recognised to be conservative. It should also be noted that the German Standard is internationally recognised and is commonly used in Australia.

The DIN 4150 values (maximum levels measured in any direction at the foundation, or maximum levels measured in (x) or (y) horizontal directions, in the plane of the uppermost floor), are summarised in Table 5.7 and shown graphically in Figure 5.3.

For residential and commercial type structures, the standard recommends safe limits as low as 5 mm/s and 20 mm/s respectively. These limits increase with frequency values above 10Hz. The operational frequency of the proposed seismic plant typically ranges from 20Hz to 30Hz, and hence according to DIN4150, the safe vibration criteria range for dwellings is 8 to 10 mm/s. For reinforced commercial type buildings the limit is as low as 25 mm/s, while for heritage or sensitive structures the lower limit is 3 mm/s.

**Table 5.7 Structural damage guideline values of vibration velocity – DIN4150**

| Line* | Type of Structure | Vibration Velocity in mm/s | | | |
|---|---|---|---|---|---|
| | | At Foundation at a Frequency of | | | Plane of Floor of Uppermost Storey |
| | | 1Hz to 10Hz | 10Hz to 50 Hz | 50Hz to 100Hz | All Frequencies |
| 1 | Buildings used for commercial purposes, industrial buildings and buildings of similar design | 20 | 20 to 40 | 40 to 50 | 40 |
| 2 | Dwellings and buildings of similar design and/or use | 5 | 5 to 15 | 5 to 20 | 15 |
| 3 | Structures that because of their particular sensitivity to vibration do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order) | 3 | 3 to 8 | 8 to 10 | 8 |

*Notes:* *1. " Line* " refers to curves in Figure 1 of DIN4150.*

*2. For frequencies above 100Hz the higher values in the 50Hz to 100Hz column should be used.*

These levels are 'safe limits', for which damage due to vibration effects is unlikely to occur. 'Damage' is defined in DIN 4150 to include even minor non-structural effects such as superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls.

Should such damage be observed without vibration levels exceeding the 'safe limits', then it is likely to be attributable to other causes. DIN 4150 also states that when vibration levels higher than the 'safe limits' are present, it does not necessarily follow that damage will occur.

As indicated by the criteria from DIN 4150 in Table 5.7, high frequency vibration has less potential to cause damage than lower frequencies. This holds true for most soil types. Furthermore, the 'point source' nature of vibration from plant causes the vibratory disturbances to arrive at different parts of nearby large structures in an out-of-phase manner, thereby reducing its potential to excite in-phase motion of the low order modes of vibration in such structures.

### iii Vibration Impacts

Vibration impacts associated with the seismic testing plant has been assessed as these are considered representative of worst case activities with respect to vibration sources.

Using historical vibration data provided by the proponent for the 'OnSeis' seismic plant, potential impacts from vibration have been consolidated into Figure 5.4. The data identifies that vibration levels will comply with both the residential and sensitive building damage criteria at offset distances of 10 m and 25 m respectively.

For the Envirovibes unit, vibration levels will comply with both the residential and sensitive building damage criteria at offset distances at 8 m and 20 m respectively, while for the mini-Sosie vibration levels will comply with both residential and sensitive building damage criteria at offset distances at 5 m and 15 m respectively.

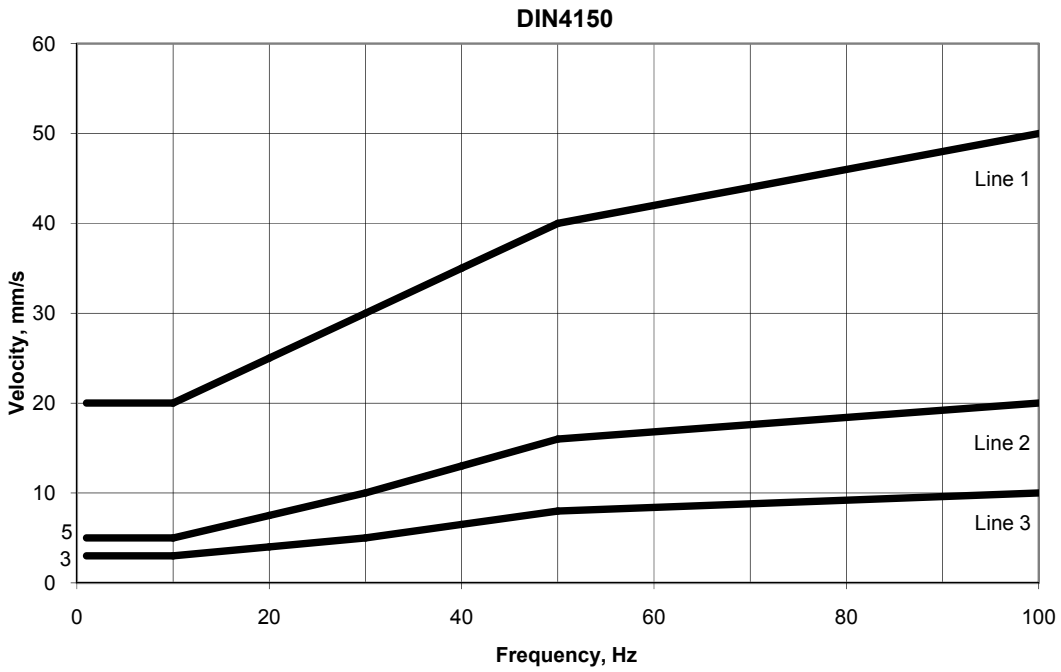


Figure 5.3 DIN4150 structural vibration safe limits for buildings

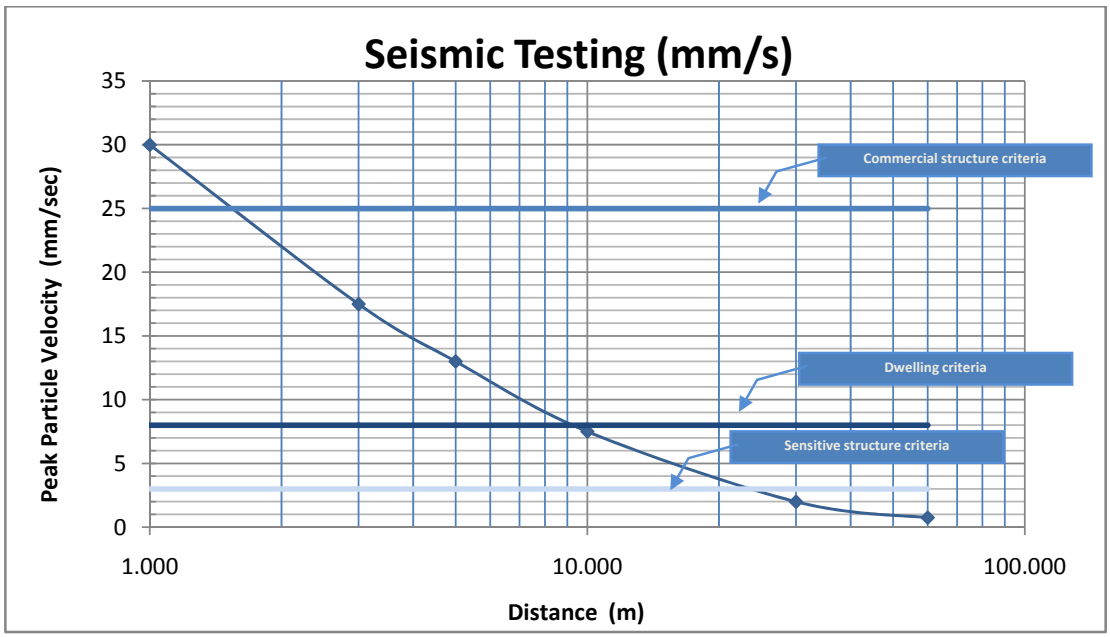


Figure 5.4 Seismic testing vibration versus distance

### 5.8.3 Noise and vibration management

For seismic testing, the mitigation strategies to manage noise and vibration include:

- machinery will not be permitted to 'warm-up' before the nominated working hours, where they are audible to residences;
- where possible, machinery will be located / orientated to direct noise away from the closest sensitive receivers;
- undertake regular maintenance of machinery to minimise noise and vibration emissions;
- maintenance will be confined to standard daytime construction hours and where possible, away from sensitive receivers;
- the quietest suitable machinery reasonably available will be selected for each work activity;
- the offset distance between items of plant/machinery and nearby sensitive receivers will be maximised;
- queuing of vehicles is not to occur adjacent to any residential receiver;
- where queuing is required, for example due to safety reasons, engines are to be switched off when possible to reduce their overall noise impacts on receivers; and
- where practicable, ensure plant/machinery are not working simultaneously in close proximity to sensitive receivers.

## 5.9 Visual amenity

This section describes the existing visual character of the area and assesses the potential visual impacts of the proposed activities on visual amenity.

### 5.9.1 Existing environment

The landscape of the Gloucester region is characterised by forested mountain ranges, meandering rivers and undulating valleys which support a mix of land uses including agriculture, mining and residential development. The proposed activities will be undertaken on existing roads and tracks in the PEL. The valley is mostly cleared of native vegetation and the dominant land use is grazing. The major waterways in the area, namely the Gloucester River, Wards River, Mammy Johnsons River, Karuah River and Avon River. Given the size of the vehicles the survey will be limited to gently undulating lands or lands with gentle rises.

The visual catchment of the proposed activities is the area in which they would be visible. The visual catchment in this instance contains a significant proportion of the PEL, which includes all properties along the roads and tracks on which the survey is proposed.

### 5.9.2 Impact assessment

The seismic survey is expected to average some 15 km per day along the selected routes in mobile motor vehicles. The seismic testing trucks and small number of associated vehicles will only be visible to property owners for a relatively short time frame. It is therefore expected that there will be no visual impacts from the proposed works. Any amenity issues will be very short term.

### 5.9.3 Mitigation measures

The proposed survey will be short term in nature and no amenity issues are anticipated. No major mitigation measures are proposed. To ensure amenity is not reduced all rubbish that is created by the works (eg off cuts of cables etc) should be removed by the contractor. Any logs or tree branches on the ground that need to be relocated for the survey works should be placed in the same area.

## 5.10 Air quality

### 5.10.1 Existing environment

The air quality in the vicinity of the proposed survey routes is influenced by typical rural activities such as cattle grazing and trucking of rural products, as well as, motor vehicles used by individuals in the rural townships within the PEL. The PEL also contains coal mines and a number of light industrial activities.

### 5.10.2 Impact assessment

The only identifiable air quality impacts associated with the proposed works include the potential pollution from the vehicles and trucks required for the survey works and possible dust emissions from the vehicles driving on exposed surfaces.

There are a small number of vehicles associated with the proposed works (see also Section 5.11). The potential air quality impacts from vehicle emissions will be negligible when the current number of vehicles using the road network in the PEL is considered. The potential emissions from dust will also be negligible when the impact of the entire road network is considered as well as the impact from existing farm activities. The trucks used for the seismic survey are also relatively slow moving which will also minimise dust emissions from the works.

Nonetheless, appropriate mitigation measures should be employed to ensure that the vehicle emissions and dust generation is negligible during the proposed works.

### 5.10.3 Mitigation measures

The following mitigation measures are proposed to minimise the potential impacts on air quality:

- speed limits on unsealed tracks should be enforced to limit potential dust impacts;
- vehicles and equipment are required to be appropriately maintained to minimise exhaust emissions. Contractors would also need to ensure all equipment is maintained and service according to the manufacturers specifications; and
- where practical, a low level of grass should be maintained where slashing is required.

With the implementation of the prescribed mitigation measures listed above it is anticipated that there would be a very minimal impact on air quality from the vehicles required as part of the survey works. It is also considered that the long term air quality impact is negligible from the proposed works.

## 5.11 Traffic

### 5.11.1 Existing environment

The major regional roads which traverse the Gloucester area are The Bucketts Way (Main Road No. 90) and the Thunderbolts Way. The Bucketts Way is a state road, but comes under local council management. Other roads that are proposed to be used for undertaking the survey works are local roads managed by Council or existing tracks on private properties.

The RTA has developed a set of road classifications (refer to Table 5.5) indicating typical traffic volumes for different road types. The traffic volumes are expressed in terms of average annual daily traffic (AADT) counts. In practice, main roads tend to have higher AADT counts than local roads. The Bucketts Way would be considered at least a sub-arterial road under the RTA classification.

**Table 5.8 RTA road hierarchy classification**

| Type of Road | Traffic Volume (AADT) | Peak Hour Volume (phv) |
|---|---|---|
| Arterial Road | Greater than 15,000 | 1,500 – 5,600 |
| Sub-Arterial Road | 5,000 – 20,000 | 500 – 2,000 |
| Collector Road | 2,000 – 10,000 | 250 – 1,000 |
| Local Road | Less than 2,000 | 0 - 250 |

*Notes: 1.Source: RTA Guide to Traffic Generating Developments (2002)*

The most recent traffic counts undertaken by the RTA in the PEL areas were in 2004. The counts are presented in Table 5.6 below. Even allowing for a 2% per annum growth rate the results in Table 5.6 reveal that The Bucketts Way has sufficient excess capacity to accommodate the proposed seismic survey.

**Table 5.9 Average annual daily traffic, 2004**

| Locality | Recording Location | 2004 AADT |
|---|---|---|
| Gloucester | 09.332 – The Bucketts Way | 4,095 |
| Stratford | 09.330 – The Bucketts Way | 1,555 |
| Weismantles | 09.919 – The Bucketts Way | 1,643 |
| Stroud | 09.916 – The Bucketts Way | 2,043 |

### 5.11.2 Impact assessment

As previously noted in the REF the seismic works will be undertaken by a seismic testing truck (vibroseis truck), a recording truck and several utility vehicles responsible for the cabling and geophones. These vehicles will only be within one area for a relatively short time period. Given the small number of vehicles and relatively short timeframe required to undertake the survey it is considered that the existing road

network will have sufficient capacity to handle the proposed works. Nonetheless, appropriate traffic control will be required for the survey works as the survey will use the existing road network.

### 5.11.3 Mitigation measures

All the vehicles utilised to undertake the seismic survey will be required to stop for a short period at any one point to allow recording of the seismic information collected from the vibroseis truck. As such, appropriate traffic control will be required. The traffic control will be required to ensure other motorists (and pedestrians/cyclists) using the roads upon which the survey will be conducted, will be able to pass the seismic survey team and vehicles in a safe manner. To this end, the contractor will also be required to obtain a road occupancy permit from the Council) to ensure the traffic control is undertaken in accordance with current standards. This would require the preparation of a Traffic Control Plan.

As part of AGL's commitment to the community, appropriate notification would be afforded to the nearby residents indicating when the survey works would commence. AGL would also maintain a community phone hotline for any concerns residents may have about the works.

Other mitigation measures regarding noise and vehicle emissions are discussed in Sections 5.8 and 5.10.

## 5.12 Soils

### 5.12.1 Existing environment

The proposed survey will be conducted on existing roads, access tracks and some cleared paddocks. Where the survey is undertaken in cleared paddocks the soils are like to be alluvial and a high proportion of sodic soils are within the area. Sodic soils are weakly structured and are considered highly erodible.

### 5.12.2 Impact assessment

The potential impacts on soil include:

- the erosion potential of the soils that are already disturbed;
- the 'bogging' of vehicles in cleared paddocks during wet weather;
- depressions created by the seismic survey vehicles in the surface of water logged paddocks; and
- the potential increase in erosion as a result of 'bogged' vehicles and surface depressions created as a result of vehicle movements.

### 5.12.3 Mitigation measures

The management of the potential impacts on soils from the proposed works can be mitigated through a number of measures. This includes:

- undertaking works on existing access tracks and roads where possible;
- avoiding waterlogged areas following wet climatic conditions; and
- rehabilitating areas where surface depressions may be created or where vehicles have been bogged.

### 5.12.4 Acid sulphate soils

#### i Impact assessment

A search of the Natural Resource Atlas revealed that the survey works will not be conducted in an area of acid sulphate soils risk (Appendix B).

#### ii Mitigation measures

No mitigation measures are proposed given that there are no acid sulphate soils located in the proposed area of activity.

## 5.13 European heritage

### 5.13.1 Impact assessment

A search was conducted of the following to identify whether any European heritage items may be potentially impacted by the proposed survey (Appendix B):

- Gloucester LEP;
- Great Lakes LEP;
- NSW Heritage database; and
- Australian Heritage database.

The searches revealed that the no items of local, state or national significance are likely to be impacted by the proposed survey works. The heritage item identified closest to the proposed survey works was the Australian Agricultural Manager's House, formerly 'Gloucester Cottage', just south of the township of Gloucester. The survey works are likely to be approximately 150 m from the cottage. It is considered that the proposed works are unlikely to affect any items of European heritage significance. Section 5.8 above also identifies that there will be no impact on buildings from vibration as part of the proposed works.

### 5.13.2 Mitigation measures

No mitigation measures are proposed given no heritage items are predicted to be impacted from the proposed activity.

## 5.14 Bushfire

### 5.14.1 Impact assessment

There is a bushfire risk due to the presence of open pastures and some road-side vegetation that will be adjacent to the proposed works.

### 5.14.2 Mitigation measures

To minimise risk, contractors would be required to:

- minimise the storage of fuel on vehicles and ensure that it is safely stored at all times;

- ensure facilities for fire fighting purposes, eg fire extinguisher are available on vehicles; and
- prohibit smoking and cease any activities which could cause sparks on days of extreme fire danger.

## 5.15 Contamination

### 5.15.1 Existing environment

The survey will utilise existing roads, access tracks and cleared paddocks. The areas selected for the survey are therefore highly disturbed areas.

### 5.15.2 Impact assessment

A search of orders issued by OEH under the NSW *Contaminated Land Management Act 1997* and actions taken under the NSW *Environmentally Hazardous Chemicals Act 1985* revealed no orders or actions have been issued for areas in the immediate vicinity of the works.

The only contamination issue that needs addressing as part of the works is the potential for fuel or oil leaks from the motorised vehicles required for the works.

### 5.15.3 Mitigation measures

Appropriate mitigation measures such as ensuring vehicles are maintained to the manufacturer's specifications and the availability of spill kits are recommended mitigation measures to ensure no contamination occurs from the proposed works.

## 5.16 Waste

### 5.16.1 Impact assessment

There may be a minimal amount of waste (eg off cuts of cabling etc) generated as part of the proposed works.

### 5.16.2 Mitigation measures

All wastes are to be disposed of in an appropriate manner, and at an authorised waste management centre, if required.

## 5.17 Socio-economic and community considerations

Due to the limited duration of the proposed survey works no significant social impacts are anticipated. AGL is not expected to employ a large workforce that would require an upgrade of existing community and recreational facilities in the area. There would, however, be positive socio-economic effects associated with propose short term works including the flow on effects of employees spending their income on accommodation, food and entertainment in the area.

## 5.18 Cumulative impacts

This REF has considered the cumulative environmental impacts of a proposed seismic survey in the Gloucester region of NSW. A number of environmental investigations were undertaken as part of this REF. Consideration has been afforded to the wider area within the assessment, including the environmental

investigations prepared as part of the wider GGP. For example, the ecological investigations have considered the impact of the proposed works in relation to proposed corridors and future wildlife movements in the area.

This REF has examined the impact of proposed survey works and recommended a number of mitigation and management controls to ensure that the proposed works have a negligible impact on the local environment and community. AGL and its contractors would also be required to undertake works in accordance with AGL's EMP and the recommendations of this REF, to ensure the works would have a negligible impact on the local environment.

Overall, it is considered that if the recommendations of this report and appropriate controls are in place during the works the development is unlikely to have any cumulative environmental impact.

## 5.19 Summary

Table 5.7 below summaries the issues that have been identified as a result of the proposed works based on the investigations undertaken as part of this REF, and mitigation measures identified as a result of the environmental investigations. These recommendations should complement those identified in AGL's EMP. All workers should comply with the recommendations of this REF and AGL's EMP.

**Table 5.10 Summary of issues environmental issues raised**

| Item | Potential Impact or Issue(s) | Management Considerations |
|---|---|---|
| Environmental management | No identifiable impacts at present. | Contractor shall maintain an Environmental Management System<br><br>Any environmental incident(s) shall be reported to the relevant authority<br><br>All contractors are to be made aware and comply with AGL's EMP<br><br>All contractors should be made aware of the issues and management considerations identified in this REF |
| Contamination | No identifiable impacts at present. | Spill kits are to be available<br><br>Any liquid or oils spilt during the works shall be immediately contained and cleaned up<br><br>All chemicals (including fuel) shall be stored and transport in accordance with hazardous material and safety regulations |
| Surface water | Potential impacts from sediment flowing into nearby watercourses | Use of sediment fences/traps, diversion drains, hay bales etc to prevent soil loss, if required<br><br>The storage of fuel on vehicles would be minimised<br><br>Any fuels or other fluids should be stored in an appropriate place<br><br>Bunding of oil and fuel storages and |

## Table 5.10 Summary of issues environmental issues raised

| Item | Potential Impact or Issue(s) | Management Considerations |
|---|---|---|
| | | maintenance of a spill control kit<br><br>Restoration of all disturbed ground immediately following completion of the works, if required |
| Groundwater | Potential impact of contaminates entering the groundwater. | The storage of fuel on vehicles would be minimised<br><br>Any fuels or other fluids should be stored in an appropriate place<br><br>Bunding of oil and fuel storages and maintenance of a spill control kit |
| Flora and fauna | Potential impacts on threatened flora and fauna. | In identified sensitive areas (refer to Figure C.1) which cannot be avoided and if some slashing is to occur, a pre-clearance survey will be undertaken by an experienced ecologist. The project ecologist will provide advice to the survey team to plan the seismic survey route to minimise potential impacts to these areas. If required, this survey will include:<br>the identification, marking and avoidance of threatened plants and bird nests;<br><br>a 10 m 'no slashing' buffer zone established around hollow-bearing trees to maintain groundcover and minimise potential impacts to resident fauna;<br><br>a 20 m 'no slashing' buffer zone established to maintain groundcover where owl or Glossy-black Cockatoo (Calyptorhynchus lathami) nest sites are identified;<br><br>woody ground debris moved by hand and replaced in original location under the supervision of the ecologist;<br><br>a 10 m 'no slashing' buffer zone established around identified threatened frog habitats; and<br><br>avoidance of areas of EEC.<br><br>The environmental management plan will be updated to include:<br><br>on-site environmental management to advise contractors and other on-site personnel on ways of |

**Table 5.10 Summary of issues environmental issues raised**

| Item | Potential Impact or Issue(s) | Management Considerations |
|---|---|---|
| | | minimising ecological impacts. Personnel should be briefed on the importance of the Grey-crowned babbler and laminated photos of this species and its nests placed in each vehicle for identification;<br><br>traffic control measures will be required for the works. Slower speeds should be adhered to reduce the risk of fauna injuries;<br><br>measures to prevent the spread or introduction of weeds at all work sites;<br><br>rubbish management; and management of any chemicals, fuels and wastes |
| Heritage | Potential impacts on Aboriginal heritage items | The geographical coordinates of known heritage items in close proximity to proposed survey routes should be provided to the contractor and these items should be avoided<br>An appropriate buffer (ie 10 m) from known Aboriginal items should be instigated for the survey works<br><br>No excavation works are to be undertaken as part of the survey<br><br>In the event that a potential European heritage or Aboriginal cultural heritage item or artefact is identified during on-site works, work is to cease, and the finding reported to OEH |
| Visual | Potential visual amenity issues for neighbouring residents. | A complaints hotline to be established if an individual has a concern about visual amenity |
| Noise and vibration | Impact on residents from vehicle noise and vibration | Machinery will not be permitted to 'warm-up' before the nominated working hours, where they are audible to residences<br><br>Where possible, machinery will be located / orientated to direct noise away from the closest sensitive receivers<br><br>Undertake regular maintenance of machinery to minimise noise and vibration emissions<br><br>Maintenance will be confined to standard daytime construction hours and where |

**Table 5.10 Summary of issues environmental issues raised**

| Item | Potential Impact or Issue(s) | Management Considerations |
|---|---|---|
| | | possible, away from sensitive receivers<br><br>The quietest suitable machinery reasonably available will be selected for each work activity<br><br>The offset distance between items of plant/machinery and nearby sensitive receivers will be maximised<br><br>Queuing of vehicles is not to occur adjacent to any residential receiver<br><br>Where queuing is required, for example due to safety reasons, engines are to be switched off when possible to reduce their overall noise impacts on receivers<br><br>Where practicable, ensure plant/machinery are not working simultaneously in close proximity to sensitive receivers<br><br>The data identifies that vibration levels for the 'OnSEIS' plant will comply with both the residential and sensitive building damage criteria at offset distances of 10 m and 25 m respectively<br><br>Data also identifies that vibration levels will comply with both the residential and sensitive building damage criteria at offset distances of 8 m and 20 m respectively<br><br>Mini-Sosie offset distances for vibration levels for residential and sensitive building criteria are 5 m and 15 m respectively |
| Air quality | Potential impact of dust and vehicle emissions. | All machinery, vehicles and equipment should be maintained in accordance with the manufacturers' specifications<br><br>Speed limits should apply on exposed surfaces to reduce dust<br><br>Engines and machinery should be switched off when not in use |
| Traffic | Potential noise and emissions from traffic<br><br>Vehicle and pedestrian access while the survey is being conducted | Appropriate notification would be afforded to the nearby residents indicating when the works will commence<br><br>AGL would also maintain a community phone hotline for any concerns residents may have about the works<br><br>All vehicles should be maintained |

## Table 5.10 Summary of issues environmental issues raised

| Item | Potential Impact or Issue(s) | Management Considerations |
|---|---|---|
| | | according to the manufacturers specifications (see also noise mitigation measures).<br><br>Appropriate traffic control measures are to be put in place during the works |
| Waste | Minor waste from the works | All wastes are to be removed and disposed of at an appropriate location |
| Bushfire | Potential bushfire threat | Minimise the on-site storage of fuel and ensure that it is safely stored at all times.<br><br>Ensure facilities for fire fighting purpose are available on vehicles<br><br>Prohibit smoking and cease any activities which could cause sparks on days of extreme fire danger |
| Flooding | Potential impact on two routes from flooding | The contractor should review weather forecast prior to starting work at a particular site<br><br>All contractors should be made aware of egress arrangements in case of a severe storm |
| Soils | Potential erosion impacts from the survey works | Waterlogged areas should be avoided<br><br>Following wet conditions the survey should be confined to existing tracks and roads<br><br>Where surface depressions are made or vehicles are bogged, the affected areas should be rehabilitated to ensure no erosion occurs |
| Acid sulphate soils | No impact identified | None |
| Social and economic | No significant impacts identified | None |

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# 6 On-site management of works

## 6.1 Safety and risk management

### 6.1.1 General safety management

A safety management plan should be prepared and be available for all employees and contractors. The safety management plan would include safety and risk management. An induction will be undertaken with all employees and contractors. It would be expected that safety management is identified in the contractor's occupational health and safety system.

The following procedures should be included within the safety management plan:

- suitable protective clothing, headgear and footwear are to be worn at all times in accordance with Workcover requirements;
- a comprehensive first aid kit, including a snake bite kit is to be available at all times;
- a reliable system of communication would be maintained to enable accidents to be reported and medical assistance to be obtained, if required;
- all equipment is to be maintained according to the manufacturers specifications;
- all contractors would be required to use their own discretion as to whether working conditions are safe in the case of heavy rain, strong winds, extreme fire danger or electrical storms; and
- fire fighting equipment should be available in case of a bushfire.

### 6.1.2 Traffic management

As discussed previously, traffic control will be required to ensure the safe movement of other vehicles and pedestrians/cyclists using public roads which are to be traversed by the survey works. A Traffic Control Plan (TCP) will be required as part of the road occupancy permit.

### 6.1.3 Stock and injury loss

If there is stock present on a private lot accessed for survey works, appropriate management (including walking the seismic lines prior to the works) and speeds limits to prevent any stock or native animals (eg kangaroos) entering the work 'zone' is required. Smaller animals would be discouraged from entering the work zone by ensuring all rubbish is correctly disposed.

## 6.2 General environmental management of works

Any contractor(s) who undertakes work on the subject sites would be required to have any understanding of AGL's EMP. A copy of the EMP is provided in Appendix A. The EMP is to be available per work crew, together with an Emergency Response Procedure (ERP) and safety management plan.

## 6.3 Rehabilitation

The proposed seismic survey will not require a significant amount of rehabilitation works. The survey will be limited where possible to existing roads and access tracks, and in some instances, cleared paddocks. . Mitigation measures have been recommended to minimise any ground disturbance.

It is considered unlikely that groundcover will be removed as a low level of grass/vegetation will be retained where slashing is required,

Rehabilitation may be required in the unlikely event of a vehicle becoming bogged. Any rehabilitation works will be required to return the area to its natural/existing condition.

# 7 Conclusions

## 7.1 Justification for the proposal

A justification for the proposal is identified in Section 1.9, however, the proposed seismic survey identified in this REF is being conducted to ascertain to obtain a better understanding of the underlying geology of PEL 285. This understanding will assist in identifying and refining locations for CSG extraction and to evaluate the coal seam and gas characteristics in accordance with the requirements of PEL No 285. In particular, the works are proposed in accordance with the Third Schedule, Work Program of the PEL. Under the conditions of this Schedule a minimum work program is required to be undertaken by AGL as agreed with DII, for the period of the license term.

## 7.2 Summary and mitigation measures

This REF has assessed the potential environmental impacts of a proposed seismic survey located near Gloucester, NSW. The REF has been prepared in accordance with the EP&A Act and EP&A Regulation.

The proposed survey by AGL aims to explore the potential CSG in PEL No 285. The results of the environmental investigations prepared for this REF, including those prepared for the GGP anticipate that the proposed survey would have no significant impacts, or cumulative impacts, on the environment. The assessment identified environmental interactions which would require the implementation of prescribed mitigation measures in order to minimise potential impacts resulting from the proposed works. It should also be noted that the proposed works will be over a relatively short time period, and will not be stationary at any point for a significant length of time.

A summary of issues identified during the preparation of this REF and proposed mitigation and management controls are provided in Section 5. Section 7.3 assessed the proposal against the requirements of clause 228 of the EP&A Regulation, which is required when preparing an REF under section 111 of the EP&A Act.

This REF has also examined the cumulative impacts of the proposed survey. Environmental investigations prepared for the subject sites assessed the proposed route(s) in their broader environment. Mitigation measures would be implemented address potential impacts identified in this REF. The proposed survey has been examined in relation to a range of environmental issues including, but not limited to, surface water, groundwater, Aboriginal heritage, ecology, noise, vibration, waste and air quality along the proposed routes, and within the local area. The investigations prepared as part of this REF also considered previous environmental studies prepared in the Gloucester area, particularly those prepared for the GGP.

The proposed seismic survey presented in this REF is for exploration purposes, which is covered under Part 5 of the EP&A Act. Where applicable, a holistic approach is taken by AGL in identifying how individual projects fit in with the broader GGP. For example, the community consultative committee established by AGL is kept informed about all projects in PEL No. 285.

Overall, if the recommendations of this REF are followed, and the survey is implemented in accordance with current environmental standards and guidelines, including AGL's EMP, the proposed works will have a minimal impact on the environment.

## 7.3 Compliance with clause 228 of EP&A Regulation

It is considered that the proposed seismic survey is compliant with clause 228 of the EP&A Regulation, as outlined in the table below.

**Table 7.1 Compliance with clause 228**

| Factors to Consider | Compliance |
|---|---|
| Any environmental impact on a community. | The proposed works would have no significant impact on the community. Appropriate mitigation and management measures for potential environmental issues have been identified in this REF and would be included with AGL's EMP. These management methods, and the proposed works will be in accordance with Australian Standards and industry best practice. AGL will establish a community phone hotline in case any environmental issues are raised during the works. |
| Any transformation of a locality. | The proposed works have been identified to comply with the requirements of PEL 285. The proposed works are exploratory and are short term in nature. Nearby residents will be consulted about the survey prior to any works commencing. Appropriate environmental controls have been identified that should be implemented during works. If so, there would be no transformation of locality as a result of the proposal. |
| Any environmental impact on the ecosystems of the locality. | The environmental assessment conducted as part of this REF has identified that the proposed works would not have any significant impact on environment and ecosystems of the locality. Appropriate mitigation measures would be in place prior to and during the survey that will further ensure no significant impacts on the environment. |
| Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality. | The environmental assessments prepared for the proposed works have noted that the proposed survey would not reduce the aesthetic, recreational, scientific or other environmental quality of the locality. The works would be undertaken in an existing environment already disturbed, and be predominantly undertaken on roads and access tracks. The proposed works are short term in nature, and are unlikely to cause any significant visual issues. An EMP would be in place prior to the commencement of works to ensure negligible environmental impacts during the survey. |
| Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations. | The environmental investigations conducted for the survey route have noted that the proposed works would not impact on the locality, Aboriginal cultural heritage, and non-indigenous heritage, nor social or visual significance of the area. An appropriate industry standard EMP would be in place prior to the survey works to ensure no environmental impacts this phase. The proposed survey has been identified as result of the requirements of the PEL and community consultation has been conducted. Ongoing consultations and implementation of an environmental management plan would also ensure that there are no long term impacts on the environment as a result of the proposed development. |
| Any impact on the habitat of protected fauna. | An assessment of flora and fauna has been prepared for the proposed works which identifies that the survey will have no impact on the habitat of protected fauna, if the recommendations of this REF are implemented. Where potential sensitive areas where slashing will occur are identified, a walkover would be conducted prior to the commencement of slashing. |
| Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air. | An assessment of flora and fauna has been prepared for the proposed survey which identifies that the works would not have any impact on endangered species or ecological communities. Appropriate management, including a pre-clearance survey in identified potential sensitive areas where slashing will occur, will be undertaken by the contractor. |
| Any long-term effects on the environment. | An assessment has been made of any environmental impacts that may occur as a result of the proposed works. The survey would be undertaken in an existing environment that is already disturbed including access tracks and |

| Factors to Consider | Compliance |
|---|---|
| | roads. With appropriate management strategies in place during the survey by the contractor there would be no long term negative impacts on the environment. The contractor would be required to undertake works in accordance with the recommendations of this REF and AGL's EMP. |
| Any degradation of the quality of the environment. | The environmental assessment prepared for the proposed works has not identified any degradation of the quality of the environment. The survey will be undertaken in the existing environment which is disturbed. Appropriate removal of waste, control of any potential erosion or runoff, and the implementation of the flora and fauna mitigation measures will ensure the environment is not degraded in any manner . An appropriate EMP would also be in place prior to the commencement of works to ensure the protection of the environment. |
| Any risk to the safety of the environment. | The proposed development does not pose any risk to the safety of the environment. The environmental assessment of the proposed works has not identified any significant impacts, and any future environmental risks as part of the survey would be managed through an appropriate environmental management plan. This plan would include the on-site management of safety (including bushfire) and an emergency response plan. |
| Any reduction in the range of beneficial uses of the environment. | The assessment of environmental impact as a result of the proposed works has not identified any significant impacts. With appropriate management strategies in place during the works by the contractor there would be no reduction in the range of beneficial uses of the environment. |
| Any pollution of the environment. | The proposed survey and testing will be over a relatively short timeframe. Appropriate erosion and sediment controls, if required, would be implemented as discussed, which would also be identified in a site EMP. All waste products would need to be stored on vehicles, and disposed of in an appropriate manner. There are some potential noise impacts as a result of the works, although these will be short term, and no cumulative impact is expected. |
| Any environmental problems associated with the disposal of waste. | All waste products are to be removed and disposed of in an appropriate location. No major problems are expected from the works in relation to waste. |
| Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply. | The seismic survey is proposed to identify CSG reserves prior to any drilling or extraction. These latter activities will require further approval from DTIRIS. No increased demand on any resources is identified as the proposed works are for testing and obtaining geological information. |
| Any cumulative environmental effect with other existing or likely future activities. | The proposed works would not have any significant impact on the environment, now or into the future as discussed in Section 5. Appropriate mitigation and management of potential environmental issues, if adhered to, would have no significant impact on the environment. Any contractors would be required to undertake works in accordance with the recommendations of this REF and AGL's EMP. If works are undertaken in accordance with these requirements any potential impacts on the environment can be managed and reduce the risk of any impact to the environment. Overall, it is considered that if the recommendations of this report and appropriate controls are in place during the survey the works are unlikely to have any cumulative environmental impact. Consultations would be ongoing with the community and key stakeholders such as DTIRIS to ensure that the works are undertaken in accordance with industry best practice and current standards. |

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# Appendix A

## Environmental Management Plan

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# AGL Upstream Investments Pty Ltd

**PROCEDURE**

# ENVIRONMENTAL MANAGEMENT PLAN

## GLOUCESTER BASIN (PEL 285)

## COAL SEAM METHANE GAS – EXPLORATION DRILLING AND PRODUCTION EVALUATION TESTING

# Gloucester Gas Project

## ENVIRONMENTAL MANAGEMENT PLAN

**AGL Upstream Investments Pty Ltd**

**Document Control**
Environmental Management Plan

**Approval:**

| | |
|---|---|
| **Authorising Officer** | David Kelly |
| **Title** | Head of Land and Approvals, Gas and Power Development |
| **Signature** | |
| **Date** | 1/7/10 |

**Revision Status:**

| Revision | Date | Prepared By | Checked By | Approved By | Comments |
|---|---|---|---|---|---|
| 0 | April 2009 | TL | SG | SG | |
| | | | | | |
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## 1.0 PURPOSE

AGL has developed this Environmental Management Plan (EMP) to control and manage the environmental impacts of its activities in undertaking exploration drilling and production evaluation testing for coal seam methane gas in the Gloucester Basin.

This EMP has been prepared under the framework of the ISO 14001 Environmental Management System (EMS) standard.

The AGL Energy Health, Safety and Environment Policy and documentation should be considered in parallel with this EMP to promote a better understanding of the requirements and standards implied.

## 2.0 INTRODUCTION

This EMP has been developed for the activities currently being undertaken as part of AGL's exploration and production testing activities in the Gloucester Basin, as well as a basis for those that are proposed for the future as the project develops.

### 2.1 Background

The Gloucester Basin is located in New South Wales, approximately 100 km north of Newcastle. AGL is the operator for exploration activities for coal seam methane gas in the basin. The area is administered under Petroleum Exploration Licence (PEL) 285, which enables investigation of resources with a view to possible development of a production field in the near future.

The location of the PEL area is approximately centred on the township of Stratford, some 70 kilometres (km) north of Newcastle in New South Wales (NSW). The area extends approximately 60 km north to south and approximately 20 km east to west comprising some 18 graticular blocks and about 1,308 square kilometres ($km^2$) (Figure 1). The area completely contains the Gloucester Geological Basin.

The project is a conventional coal seam methane gas project, involving petroleum exploration activities including drilling and production evaluation testing.

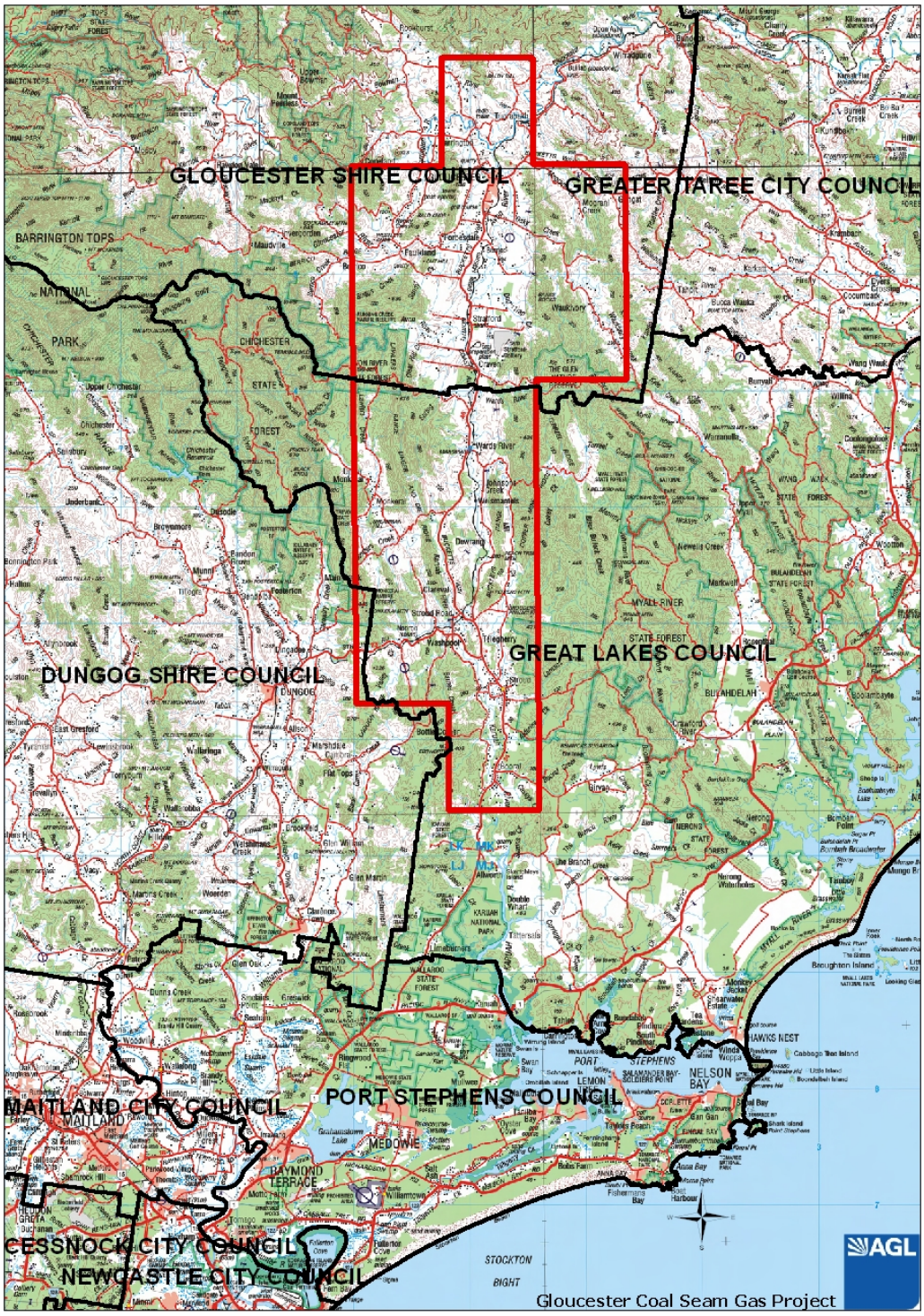


Figure 1– Project Area

## 2.2 Description of company activities

AGL is an ASX listed group and has been operating in Australia for 170 years and was one of its first listed companies. The company has activities in investing in sustainable energy businesses such as wind farms and innovative environmentally friendly projects such as the underground Bogong hydroelectric

power station in Victoria's High Country, and manages various coal bed methane assets, which include interests in permits in Queensland and NSW.

Coal seam gas (CSG) has developed rapidly in Australia over the last decade, emerging as a flexible, clean and competitive source of energy in an expanding economy seeking lower pollution fuels.

As extraction technology has developed and with the world increasingly carbon-conscious (coal seam gas produces approximately half the greenhouse gas emissions of coal) coal seam gas is seen as an increasingly valuable resource in Australia and abroad.

Extraction of coal seam gas differs from natural gas by targeting specific seams of coal, often at significant depths that make mining otherwise economically unviable. Removal of the gas is induced by reducing the hydrostatic pressure of water also contained in the coal seams. As the water is pumped out the reduction in pressure enables the flow of gas, which increases as the water level is reduced over time.

### 2.3 Scope

This EMP incorporates the environmental policies of AGL that are to underpin each activity the company takes in the exploration and development of coal seam methane prospects. AGL aims to meet, if not exceed best industry practice in environmental management associated with all its activities. This document has been produced in the framework of ISO 14001.

All subcontractors, consultants and suppliers working on any AGL project shall be bound to the requirements of the AGL Environmental Management Plan for that project, if they do not have in place a compliant Management System of their own.

## 3.0 OBJECTIVES & TARGETS

AGL aims to conduct its operations to the highest practicable level with regard to environmental protection and in accordance with all standards and regulation. AGL's environmental objectives include:

- To achieve a zero incident rate by good forward planning, implementation of environmental controls through training and awareness of all employees.

- To achieve compliance with all applicable regulatory requirements and other relevant industry standards and codes.

## 4.0 DEFINITIONS

For a full list of definitions, refer to **Environmental Management Systems – Specification with guidance for use** (Australia/New Zealand AS/NZS ISO 14001:2004) and **Occupational Health and Safety Management System**-AS/NZS 4801:2001).

## 5.0 ENVIRONMENTAL POLICY

**a)** AGL adheres to the AGL Health, Safety and Environment Policy, which has been developed with consideration for:

- The nature, scale and environmental impacts of the company's activities, products and services
- Prevention of pollution
- Statutory and other requirements
- Scope for continual improvement
- Providing a framework for setting and reviewing environmental objectives and targets

**b)** The Health, Safety and Environment Policy is communicated to all persons working for or on behalf of the organisation.

**c)** Top Management shall review this Policy at least annually.

## 6.0 PLANNING

### 6.1 Environmental Aspect Identification and Evaluation

AGL shall endeavour to minimise the impacts of its activities on the environment by identifying environmental hazards and putting into place controls to eliminate, where ever possible, any identified risk to the environment. Components of the environment to be considered include, but are not limited to:

- Water quality
- Marine environment
- Noise
- Air quality
- Visual quality
- Flora and fauna
- Heritage significance
- Surrounding community
- Vibration
- Natural resources

The Land and Approvals Manager and Operations Manager shall continually identify the environmental aspects of AGL's activities and develop safeguards/actions to mitigate the environmental impacts of these aspects. Resources for identifying a project's aspects include;

- EMP Status Plan,
- cross checked with Project Risk Assessments and
- JSEA record.

This information can then be used to formulate and revise the Project Environmental Management Plan, including a detailed environmental risk assessment and required actions to protect the environment. A register of

Activities, Aspects and Impacts has been developed as part of this process.

To determine those aspects that carry significant environmental risk, a risk assessment (as shown in Table 1) is used to rank the identified impacts. Environmental impacts are determined according to the:

- probability of occurrence; and
- severity of impact.

| Likelihood | Minor | Important | Serious | Major | Catastrophic |
|---|---|---|---|---|---|
| Almost Certain | 2.5 Moderate | 5 High | 7.5 High | 20 Extreme | 25 Extreme |
| Likely | 2 Moderate | 4 Moderate | 6 High | 16 Very High | 20 Extreme |
| Possible | 1.5 Low | 3 Moderate | 4.5 High | 12 Very High | 15 Very High |
| Unlikely | 1 Low | 2 Moderate | 3 Moderate | 8 High | 10 Very High |
| Rare | 0.5 Low | 1 Low | 1.5 Low | 4 Moderate | 5 High |

Consequence

**Table 1 - Risk matrix**

The risk assessment enables AGL to prioritise and focus on those activities that present significant environmental risk to the organisation.

Table 2 summarises the activities, aspects and impacts along with the associated environmental risk.

| Activity | Aspect | Impact | Likelihood | Severity | Consequence |
|---|---|---|---|---|---|
| All Activities | Vegetation clearing | Removal or damage to threatened or endangered species | Unlikely | Serious | Moderate |
| | | Introduction of weed species | Likely | Important | Moderate |
| >Establishing drill pads & access tracks | | Loss of visual amenity | Unlikely | Minor | Low |
| | Flora & Fauna | Removal of wildlife habitat | Likely | Important | Moderate |
| | | Disturbance to local fauna | Likely | Important | Moderate |
| >Pond, sump & water storage construction | Soil & Erosion | Instability caused by earthworks | Likely | Serious | High |
| | | Disruption to soil structure and horizons | Likely | Important | Moderate |
| | | Runoff to local waterways | Possible | Major | Very High |
| >Drilling, perforation and fraccing | | Contamination from hazardous materials | Possible | Major | Very High |
| | Noise | Heavy machinery movement for long durations | Almost Certain | Important | High |
| | Air | Dust creation from machinery and earthworks | Almost Certain | Important | High |
| >Pipeline and gathering line construction | Water | Runoff of sediment into local waterways | Possible | Serious | High |
| | | Runoff of fuel and chemicals to surface and ground waters | Unlikely | Major | High |
| | Cultural Heritage | Disturbance of culturally sensitive sites | Possible | Serious | High |
| >Well operation | Waste | Inefficient resource use | Unlikely | Minor | Low |
| | | Loss of visual amenity | Unlikely | Minor | Low |
| | | Health risk | Unlikely | Minor | Low |
| | Bushfire | Personal safety | Rare | Major | Moderate |
| | | Loss of property and wildlife habitat | Rare | Major | Moderate |
| | Community | Increased traffic | Almost Certain | Important | High |
| | | Loss of amenity | Rare | Important | Low |
| Pond, sump & water storage construction | Flora & Fauna | Fauna falling into water sumps or storages | Unlikely | Serious | Moderate |
| | Soil & Erosion | Damage to soil structure from excavations | Almost Certain | Serious | High |
| | | Enhanced risk of soil erosion | Almost Certain | Serious | High |
| | Water | Leaching of contaminated water into groundwater | Possible | Major | Very High |
| | | Disposal of contaminated water | Almost Certain | Serious | High |
| Drilling, perforation and fraccing | Air | Dust or emission creation from heavy machinery | Likely | Important | Moderate |
| | | Gas emissions from well | Likely | Critical | Moderate |
| | Noise | Increased noise nuisance from fraccing | Likely | Important | Moderate |
| | Soil & Erosion | Contamination from hazardous material spills | Likely | Serious | High |
| | Water | Contamination from hazardous material spills | Likely | Serious | High |
| Well operation | Air | Venting or release of greenhouse gases | Possible | Important | Low |
| | Soil & Erosion | Contamination of soils from inappropriate disposal of poor quality water | Possible | Important | Moderate |
| | | Erosion caused by excess runoff from water disposal | Possible | Important | Moderate |
| | Water | Potential spill of poor quality water produced from wells to surface and ground | Possible | Serious | High |

**Table 2 – Register of Activities, Aspects and Impacts**

## 6.2 Legal and Other Requirements

Environmental management for exploration activities throughout NSW is controlled largely by State Government legislation, although there is also applicable Commonwealth legislation which must be adhered to. AGL understands the importance of meeting its regulatory requirements, and therefore the Land & Approvals Manager will continually keep abreast of State and Federal legislation.

The current applicable legislation (outlined below) will be regularly reviewed and updated as required.

- Environment Protection and Biodiversity Conservation Act 1999 *(EPBC Act)*
- Environmental Planning and Assessment Act 1979 *(EPA)*
- State Environmental Planning Policy *(Major Projects)*
- SEPP(Infrastructure) 2007
- SEPP (Mining, Petroleum Production and Extractive Industries) 2007 *(SEPP (Mining))*
- SEPP 14 Coastal Wetlands *(SEPP 14)*
- SEPP 26 – Littoral Rainforests
- SEPP 33 – Hazardous and Offensive Industries
- SEPP 44 – Koala Habitat Protection

- SEPP - 71 Coastal Protection
- Pipelines Act 1967 *(Pipelines Act)*
- Petroleum (Onshore) Act 1991
- Water Act 1912 *(the Water Act)*
- Water Management Act 2000 *(WM Act)*
- Protection of the Environment Operations Act 1997 *(POEO Act)*
- Fisheries Management Act 1994 *(FM Act)*
- Roads Act 1993
- Native Vegetation Act 2003
- Heritage Act 1977
- Contaminated Land Management Act 1997
- Threatened Species Conservation Act 1995
- National Parks and Wildlife Act 1974
- Gloucester Local Environmental Plan
- Great Lakes Local Environmental Plan
- Australian Pipeline Industry Association Code of Environmental Practice

The AGL Environment Officer shall visit relevant Government department websites to ensure that this legislation is up to date, and shall advise personnel of changes and the impact on work activities. All environmental incidents must be recorded investigated and reported to project authority (including AGL Management) and or the appropriate local authority.

## 6.3 Objectives and Targets & Programmes

The AGL Gloucester Environmental Committee has set the objective of no breaches in compliance with statutory or other regulatory requirements. Therefore to achieve this, project specific objectives and targets have been set, taking into consideration the nature of activities, characteristics of the site, and the environmental aspects and impacts. These objectives and targets are included within the Environmental Management Procedures established for all key activities. Checklists are also in place to ensure procedures are followed.

The following procedures – included in Appendix 1 – have been developed to address identified activities and impacts:

- Produced Water Management
- Soil and Ground Stability
- Vegetation Management
- Bushfire Prevention
- Air Emissions
- Noise and Vibration
- Clearing and Grading
- Drilling, Perforation & Fraccing
- Pond Construction
- Trenching

- Cultural Heritage
- Community and Social Impact
- Waste Management
- Fuel and Chemical Storage and Spills
- Pipe stringing and welding
- Pipe laying and backfilling
- Hydrotesting
- Clean-up and Rehabilitation

The Project Environment Officer shall monitor, maintain records and report the progress made in achieving targets.

Objectives and targets shall be reviewed annually; however the following targets have been set as a minimum:

- Zero incident rate
- No breaches in compliance
- Participation in training, group meetings, environmental promotions, emergency drill and preparedness for control of potential environmental incident
- Effective management of subcontractors and project plant and equipment
- Effective implementation of safe work practices, risk analysis and risk controls
- Continual improvement in environmental performance
- Effective waste management and recycling

An Environmental Management Program has been developed to ensure all procedures are adhered to on an ongoing basis.

The Environmental Management Program includes the following information:

- Roles and responsibility
- What is to be monitored, frequency, methods for monitoring and storage of this information
- Targets and objectives
- Timeframes for achieving these objectives

The Environmental Management Program is to be reviewed at least annually, taking into consideration any changes in legislation, activities or the development of new technology.

## 7.0 IMPLEMENTATION AND OPERATION

### 7.1 Resources, Roles, Responsibility and Authority

Overall responsibility for the EMP lies with the Head of Land and Approvals. However, all staff and contractors are responsible for

undertaking activities in a way that minimises environmental impact with the aim of improving the company's environmental performance.

The organisational chart in Figure 2 outlines the key responsibilities attributed to AGL personnel involved in the development and implementation of the EMP. A description of the individual roles and responsibilities follows-:

- The Head of Land and Approvals has overall responsibility to ensure the EMP is implemented and is compliant according to the Environmental Policy. The Head of Land and Approvals will report to the Group General Manager.

- The Land and Approvals Manager is responsible for the development, implementation, monitoring and reporting in compliance with the operational components of the EMP, and Complaints Register. This includes the continuous improvement of environmental performance of people and equipment. This person reports to the General Manager.

- The Operations Manager is responsible for the daily operational requirements of site activities and associated facilities. This person will report to the General Manager.

A Project Environment Officer has been appointed to assist the Land and Approvals Manager and shall undertake the following-:

- Implement and monitor site or project specific plans
- Conduct Environmental Inductions for new employees
- Liaise with the Operations and the Land and Approvals Managers on environmental matters

Site staff shall carry out their duties as listed in their job descriptions in an environmentally responsible manner.

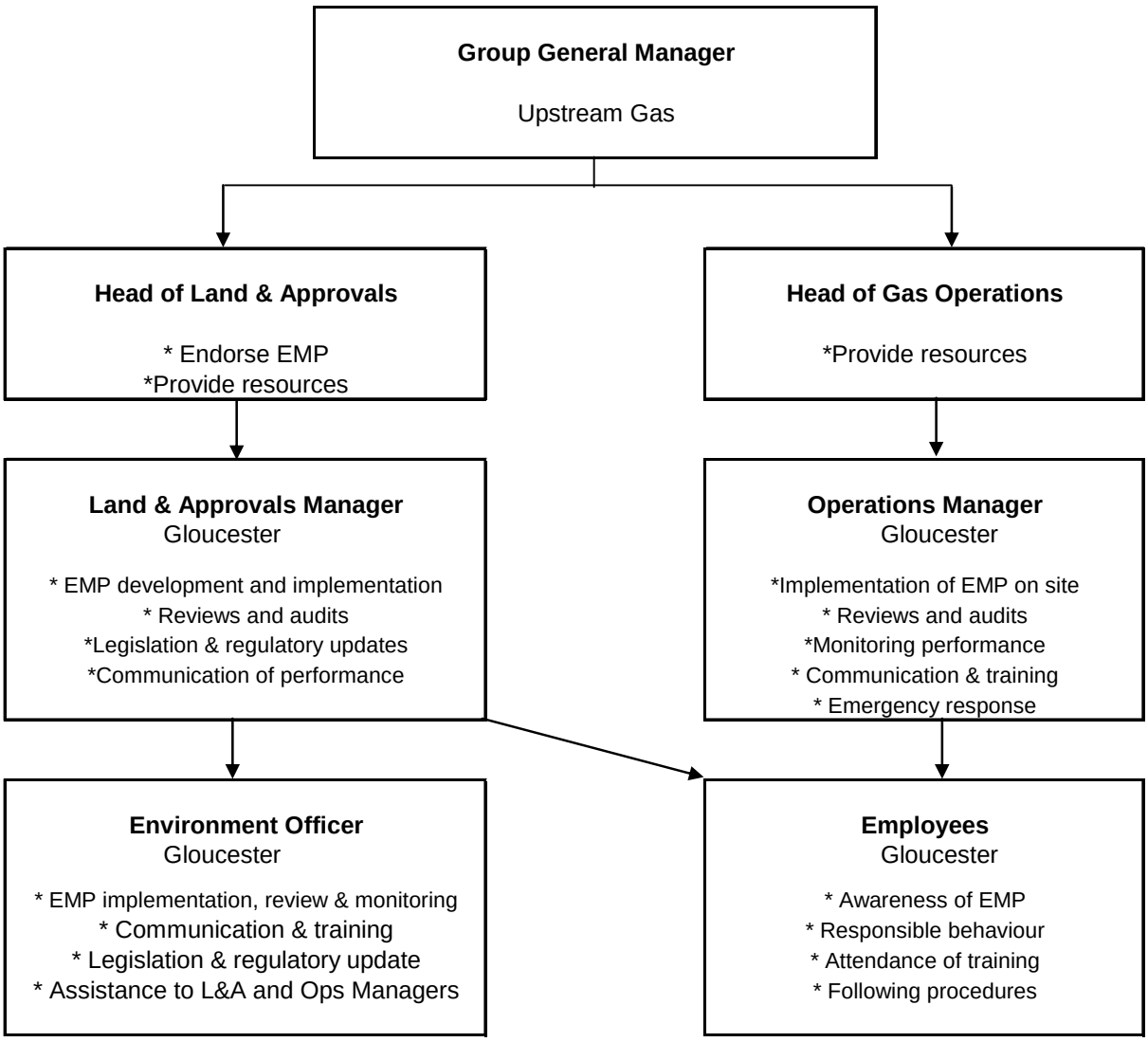


Figure 2 – Roles and Responsibilities

## 7.2 Competence, Training and Awareness

The authority for implementation and management of AGL Group environmental systems and controls is by competent people within the Group. Where circumstances demand, specialised skills and competencies will be employed.

New employees, project personnel and site visitors shall undergo a site induction.

Site inductions shall cover the following issues:

- Environmental aspects and impacts of the project
- Relevant legislation, permit conditions and other restrictions

- Compliance requirements and consequences of non-compliance
- Emergency procedures and contacts (covered in existing document)

Training and induction records for project personnel and visitors shall be kept on site, both electronically and on paper as Register of Plant & Equipment Licences, Site Induction Register and Site Visitors Register. Individual competencies for AGL employees and subcontractors will be regularly assessed by a competent environmental officer to ensure a high standard of environmental understanding.

Personnel selected to undertake tasks with the potential to cause significant environmental impact will not be deemed to be competent unless they have undergone the above training as a minimum.

## 7.3 Communication

The Land and Approvals Manager and Environment Officer shall be responsible for all environmental related communication, within AGL and with interested external parties and regulatory parties.

For project personnel, the location and access to sites shall be considered when deciding appropriate methods of communication.

Correspondence shall be documented in accordance with Data and Document Control.

## 7.4 Documentation

For details of all documentation contained within this EMP, refer to the appendix for an index.

All documents referenced in this EMP are contained in an Environmental Section within the Quality Folder on the project server.

## 7.5 Document Control

For control of documents refer to the procedure Data and Document Control / Project File System**.** Regular project weekly and/or monthly reporting of environmental status is required to ensure senior management is fully informed of environmental status of any project. Corporate systems will be reported on as a minimum annually or as legislation or other Government changes imply.

### 7.6 Emergency Preparedness and Response

An Emergency Response Procedure has been developed for the project to identify, prevent, mitigate and respond to accidents that are likely to have an environmental impact.

A Safety Management Plan has also been developed for the project to identify and mitigate against safety risks on site.

These procedures shall be reviewed with input from Project Managers and site personnel, at least annually or after the occurrence of an emergency event. Any changes to procedures must be approved by senior management.

Site Management shall display these plans in prominent locations around sites.

Site Management shall enlist local emergency response crews to carry out mock drills to test these procedures and the preparedness of site and emergency personnel.

## 8.0 CHECKING

### 8.1 Monitoring and measurement

The Environmental Monitoring Program details the procedures and timing for ongoing monitoring, review and revision of environmental management procedures.

All monitoring equipment shall be maintained as specified in the procedure for Inspection and Testing.

Refer to the Routine Environmental Monitoring Checklist and Site Inspection for a list of routine site environmental monitoring and inspection requirements.

Project Managers and Project Environment Officers shall identify project or site specific monitoring requirements, carry out a Hazard Identification and Risk Assessment, assign personnel to monitor and record this information, to track performance of operational and maintenance procedures, check for compliance with statutory or other requirements and targets and objectives and predict the likelihood of future corrective action.

### 8.2 Evaluation of Compliance

A review of applicable legislation shall be undertaken periodically to determine AGL's compliance with its applicable legal requirements.

A review of any industry standards or codes that are applicable to AGL's activities shall be undertaken periodically to determine AGL's compliance with those requirements to which it subscribes.
Records shall be kept of the above evaluations. Any deficiencies shall be recorded and corrective actions draw up and communicated to all affected personnel.

### 8.3 Non-conformance and Corrective and Preventative Action

Non conformances and corrective actions shall be dealt with as given in procedure Non Conformance**.**

### 8.4 Environmental Management Plan Audit

Internal Environmental Management Plan Audits shall be carried out in accordance with Internal Audit Procedures.

The Environmental Management Program will detail the timing of EMP audits, but at the minimum these should be conducted every three months.

External audits shall be conducted at least annually by suitably qualified auditors.

Any non-conformance or corrective action report shall be addressed as soon as practicably possible and be signed off during the completion of the next scheduled audit.

The results of audits shall be made available to all employees and AGL Management.

### 8.5 Management Review

To ensure continual improvement and effectiveness of the Environmental Management Plan, AGL Management shall participate in Management Reviews of the Plan at least annually.

Management reviews shall cover the following areas:

- Results of audits conducted;
- AGL's overall environmental performance;
- Frequency or recurrence of environmental incidents;
- Effectiveness of existing procedures (SWPs and JSEAs) for hazard identification, risk assessment and control;
- Changes in legislation, codes of practice or Australian Standards that may have an affect on compliance requirements and consequently existing risk control measures;
- Employee suggestions or recommendations;
- Any feedback from Government Agencies on environmental performance; and

- Recommendations for improvement of the Environmental Management System.

The details of Management Review meetings such as comments, observations and recommendations shall be documented.

Management shall assign responsibilities and timeframes for follow up action on recommendations to ensure these are implemented.

## 9.0 ASSOCIATED DOCUMENTS

**AGL**

* Safety Management Plan
* Emergency Response Procedure

**OTHER**

* AS/NZS ISO 14001:1996 Environmental Management Systems, *REVISED 2004* Environmental Management System – Specification with guidance for use (Australia/New Zealand AS/NZS ISO 14001: 2004)

'POEO' Protection of the Environment Operations Act 1997

APIA Environmental Policy and Code for Environmental Practice

State and Federal Occupation Health and Safety Legislation

NSW Government Environmental Management Systems Guidelines 1998

AS/NZS 4360:2004 Risk Management

# ENVIRONMENTAL MANAGEMENT PLAN

## Appendix 1 – Environmental Management Procedures

| 1. Produced Water Management | |
|---|---|
| Goals | To avoid potential impacts to quality of local ground and surface water systems and the surrounding environment |
| Responsibility | Operations Manager |
| Performance Objective | ◗ To reuse at least 10% per year of the production water for agricultural purposes.<br>◗ To prevent contamination of watercourses and creeks, particularly with regard to salinity.<br>◗ To prevent contamination of surrounding soils, particularly with regard to salinity and sodicity.<br>◗ To minimise impact on riparian, aquatic and water dependant flora and fauna. |
| Mitigation Measures | ◗ All produced water to be collected in localised storages.<br>◗ Storage ponds to be lined with a suitable polyurethane liner to prevent contamination of soil.<br>◗ Sufficient freeboard to allow for 1-in-100-year 72 hour rainfall event to be maintained in all storages.<br>◗ Production to cease when freeboard is exceeded until water can be appropriately disposed of.<br>◗ Water quality monitoring to be undertaken on an ongoing basis to inform disposal options.<br>◗ Disposal options to be discussed and agreed with relevant authorities.<br>◗ Comprehensive assessment of disposal options to be undertaken, giving preference wherever possible to beneficial use.<br>◗ Where irrigation using product water is approved, ongoing soil quality monitoring will be undertaken to assess any impacts on the local environment.<br>◗ Water quality monitoring to be undertaken prior to irrigation events. |
| Performance Measures | ◗ Proportion of production water applied to beneficial use (eg irrigation).<br>◗ No uncontrolled release of produced water into the environment. |
| Monitoring / Auditing / Reporting | ◗ Water quality monitoring to be conducted for each well (water quality monitoring procedures in place).<br>◗ Stored produced water to be quality monitored prior to release for agricultural purposes.<br>◗ Audits of produced water management procedures to be undertaken each three months, with implementation of any recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of audits and regular monitoring will be documented and incorporated into the EMP. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Engineering Design and Specifications for Produced Water Storages.<br>◗ Water Quality Monitoring Procedures.<br>◗ Produced Water Management Plan (under development). |

| 2. Soil and Ground Stability | |
|---|---|
| Goals | To prevent project work areas, including well drill pads, pipeline alignments, surface water storages and access tracks, from becoming vulnerable to soil erosion. |
| Responsibility | Land and Approvals Manager |
| Performance Objective | To control and manage access to, and work at all site locations with the following objectives:<br>◗ to minimise the potential for soil erosion;<br>◗ to adequately prevent or control sediment release to land, waterways, and dams;<br>◗ to avoid unacceptable damage to native vegetation or wildlife habitats;<br>◗ to prevent impact on agricultural production or other legitimate land uses;<br>◗ to minimise the risk of the exposure of buried assets;<br>◗ to adequately control the subsidence of any subsurface earthworks; and<br>◗ to undertake all earthworks, including site remediation, such that soil horizons and structure are maintained as far as possible. |
| Mitigation Measures | ◗ Sedimentation traps shall be installed where appropriate to prevent sedimentation runoff into waterways, dams, and agricultural land.<br>◗ Erosion control structures to be regularly inspected to ensure they are in good condition and operating effectively.<br>◗ If erosion is occurring due to inadequate vegetation, revegetation of the erosion area should be undertaken. Revegetation works should be conducted in consultation with the landowner and relevant authorities.<br>◗ Vehicular access should be restricted to stable ground where possible. Additional care should be taken near waterways and drainage lines, especially after rainfall.<br>◗ Restored ground should be routinely checked for subsidence and/or exposure, particularly at waterways and drainage lines and especially after flooding rains. If restoration is to occur, any imported soil will require landowner approval and shall be free of weeds and /or contamination.<br>◗ Drilling pad areas will be reduced to that required for operation once drilling and associated activities are complete. Sumps will be drained and the area surrounding the wellhead restored to its original condition.<br>◗ Earthen banks of above-ground water storages will be either lined with a geomembrane or planted with vegetation to avoid erosion and sediment runoff.<br>◗ The volume of produced water applied during any approved irrigation should be such that there is no risk of soil erosion.<br>◗ A monitoring program should be developed to monitor potential impacts associated with soil and ground stability. |
| Performance Measures | ◗ Reduced soil erosion in highly susceptible areas.<br>◗ Reduced amounts of sediment discharge to land and watercourses.<br>◗ No impact to existing agricultural land or existing land uses. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |

| 2. Soil and Ground Stability | |
|---|---|
| | ◗ Inspections of all work sites should be undertaken on a regular basis, particularly following any major work. At the least, an audit of procedures will be undertaken every three months.<br>◗ Well pads should be inspected following establishment and again when any work is undertaken to increase or reduce the pad size.<br>◗ Areas prone to soil erosion should be inspected following significant rainfall. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | Erosion & Sediment Control<br>◗ Daily Site Environmental Controls Checklist<br>◗ Site Environmental Checklist |

| 3. Vegetation Management | |
|---|---|
| Goals | To protect all work areas from soil erosion and to ensure the integrity of all wildlife habitats is maintained while protecting visual amenity |
| Responsibility | Land and Approvals Manager |
| Performance Objective | To control and manage work areas and access to all site areas with the following objectives:<br>◗ to promote and maintain stable vegetation cover;<br>◗ to minimise impact to native flora and fauna;<br>◗ to minimise soil erosion and sedimentation;<br>◗ to avoid losses to agricultural production;<br>◗ to reduce visual impacts; and<br>◗ to prevent and control weed invasions. |
| Mitigation Measures | ◗ In areas of poor vegetation cover and where further impacts are likely, appropriate management measures shall be taken to ensure reseeding of these areas occurs.<br>◗ Regrowth trees within 3 metres of any trench centreline shall be removed to ensure tree roots do not pose a risk to pipeline integrity.<br>◗ Access tracks shall be maintained to ensure they remain navigable, including periodic reduction of regrowth.<br>◗ Areas where recent revegetation has taken place shall remain free of vehicles or machinery movement until such time that they are deemed suitable again for traffic.<br>◗ Appropriate flora species will be selected for revegetation, and suitable guidance will be sought and consultation undertaken to ensure this.<br>◗ Vegetation outside strictly delineated work areas – such as drill pads or a pipeline corridor – should not be disturbed.<br>◗ A monitoring program shall be developed to assess the success of revegetation. Further revegetation may be required where previous attempts are less than adequate. |
| Performance Measures | ◗ Reduced soil erosion.<br>◗ No areas within the project area to be without adequate vegetation cover. |
| Monitoring / Auditing / Reporting | ◗ Regular monitoring by patrol officers.<br>◗ Sites to be inspected regularly following revegetation until deemed successful.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of any recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Site Environmental Checklist<br>◗ Weed Control Checklist<br>◗ ROW Clear and Grade Checklist |

| 4. Weed Management | |
|---|---|
| Goals | To prevent the introduction and spread of Declared Plants and environmental weeds. |
| Responsibility | Land and Approvals Manager |
| Performance Objective | ◗ No new weed species to be introduced into the area.<br>◗ The growth potential of existing noxious weeds in the project area should be minimised. |
| Mitigation Measures | ◗ Pre Construction Procedures<br>◗ An inventory of noxious weed species occurring in the project area to be undertaken and appropriate weed control procedures to be developed based on regulatory pest plant control guidelines, regional weed control programs and an assessment of weed risk.<br>◗ Washdown and Hygiene Procedures<br>◗ All on-site personnel will follow the following weed hygiene procedures:<br>o Prior to arrival at the project area, all vehicles, equipment and portable infrastructure (including trailers, generators, workshop and accommodation huts etc.) will be washed down (spray-cleaned).<br>o Cleaning procedures need to remove soil and organic matter from the surfaces of vehicles, equipment and portable infrastructure, including undercarriage and running gear.<br>o Proof of inspection, such as “washdown tickets” from state operated facilities, is required for all vehicles coming from known area of infestation, before permission is granted to enter uninfected tenure areas. If the vehicle is not considered clean by a trained weed inspector, it shall be re-washed and re-inspected before certification.<br>o A weed washdown sticker (coloured yellow) is to be placed on the windscreen of vehicles that have been certified weed free.<br>o Vehicles and machinery certified weed free shall be noted in the Weed Register to be updated regularly and located at the Site Office.<br>◗ Liaise with Local Councils and other authorities for specific weed data sets.<br>◗ Only approved access tracks and roads are to be used for access to the project area.<br>◗ Appropriate training of all personnel.<br>◗ Superintendents and supervisors will be briefed on the recognition of noxious weeds. |
| Performance Measures | ◗ During construction, regular field inspections for the presence of weeds will be undertaken, particularly in problem areas, and weed control carried out as determined by the land and Approvals Manager in consultation with Environmental Authorities.<br>◗ It will be the responsibility of the Operations Manager to ensure that proper weed management controls have been undertaken. |
| Monitoring / Auditing / Reporting | ◗ Regular monitoring by patrol officers.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of any recommendations and corrective actions.<br>◗ Any introduction of declared flora or other environmental weeds will be reported to the Land and Approvals Manager who will notify relevant |

| 4. Weed Management | |
|---|---|
| | authorities. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.<br>◗ If a substantial outbreak of a declared noxious weed is found in the project area, the following will be implemented:<br>o Vehicle movement through the area will be immediately halted.<br>o The Operations Manager will be notified as soon as practicable and in turn will notify relevant Local Council of the location of the weed problem. In addition, the local Land Protection Officer and the Administering Authority shall also be notified.<br>o The area will be assessed and treated, if necessary, by hand pulling individual plants or by boom or spot spraying, before any earth moving equipment or machinery enters the area. Under no circumstances will the plants found be chopped slashed or burned due to the potential for spreading seeds.<br>o Any vehicle leaving the affected area will be rewashed and inspected. The vehicle will then obtain a new certification sticker with a new register number and date of inspection. |
| Associated Documents | ◗ Weed Control |

| 5. Bushfire Prevention | |
|---|---|
| Goals | To prevent the cause of bushfire as a result of operational activities. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ To minimise the risk of bushfire;<br>◗ To protect the public and personnel;<br>◗ To protect property and minimise damage or loss;<br>◗ To protect flora, fauna and habitats;<br>◗ To prevent the spread of bushfire in the event of ignition; and<br>◗ To provide adequate response in the event of ignition. |
| Mitigation Measures | Implement measures to prevent and respond to bushfire incidents that are in accordance with the following-:<br>◗ AS2885.3<br>◗ Safety and Emergency Plans<br>◗ Bushfire management plans which include prevention, preparedness, emergency contacts, equipment, response and training.<br>◗ Project activities should adhere to regulatory and local fire authority guidelines and comply with fire restrictions, notification requirements and permitting procedures.<br>◗ All vehicles shall be equipped with appropriate vehicle fire extinguishers.<br>◗ Firebreaks are to be installed around facilities.<br>◗ Regular checks to ensure there is no build up of debris or vegetation matter that could cause an ignition.<br>◗ Where combustible or flammable chemicals are required to be stored on site, appropriate fire fighting equipment shall be available. Incompatible chemicals should not be stored together, and where possible, flammable liquids should be stored in a flammable liquids cabinet. |
| Performance Measures | ◗ No outbreaks of bushfire as a result of project activities. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of a bushfire are to be documented and incorporated within this EMP. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ AS2885.3<br>◗ Safety Management Plan<br>◗ Emergency Response Plan |

| 6. Air Emissions | |
|---|---|
| Goals | To minimise the release of air pollutants. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ To minimise atmospheric emissions;<br>◗ To minimise greenhouse gas emissions;<br>◗ To minimise the creation of safety hazards; and<br>◗ To minimise disturbance to the community. |
| Mitigation Measures | **GAS**<br>◗ The venting of coal seam methane gas from site infrastructure shall be minimised.<br>◗ The flaring of gas from production wells shall be limited to that necessary as part of the production evaluation process, following which flaring will be halted.<br>◗ Flaring is recognised as preferable to venting of coal seam methane gas, as the associated greenhouse gas emissions are reduced by a factor of more than 20.<br>◗ Where possible, planned venting of gas shall be conducted under favorable meteorological conditions to help assist rapid dispersion of the gas.<br>◗ Leak detection surveys shall be periodically performed along any pipeline as per AS2885.3 requirements.<br>◗ Where gas is to be released to the atmosphere, it should be flared wherever technically and economically feasible.<br>◗ Gas vent areas are to be located in accordance with regulatory and relevant Australian Standard requirements.<br>◗ Consultation with nearby residents and local authorities shall be undertaken prior to any major venting exercise.<br>**DUST**<br>◗ To minimise dust problems in the project area the following mitigation measures should be adopted as appropriate-:<br>◗ revegetate with existing species and restrict access until the vegetation is established;<br>◗ ensure designated speed limits are being observed and are appropriate;<br>◗ minimise vehicular movement;<br>◗ utilise geotextiles, hessian, mulched vegetation to help settle high dust areas; and<br>◗ Use dust suppression water where appropriate and available.<br>◗ Areas impacted by heavy bulldust should be stripped and the subsurface watered to provided a firmer base. |
| Performance Measures | ◗ Zero complaints from local residents or regulatory authorities. |
| Monitoring / Auditing / Reporting | ◗ Monitoring will be on a regular basis during inspections by patrol officers.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |

| 6. Air Emissions | |
|---|---|
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ AS2885.3<br>◗ Dust Control |

| 7. Cultural Heritage | |
|---|---|
| Goals | To avoid impact on sites which have heritage or cultural value. |
| Responsibility | Land and Approvals Manager |
| Performance Objective | ◗ To avoid impact to known sites or sites discovered within or near the project area.<br>◗ To implement an effective consultation program with traditional landowners, community groups, regulatory authorities, and other relevant stakeholders. |
| Mitigation Measures | ◗ The inventory of heritage sites compiled for the Cultural Heritage Management Plan shall be referred to prior to any maintenance or construction activity.<br>◗ Heritage sites within or close to project areas shall be adequately marked or barricaded off to ensure they are not disturbed.<br>◗ Patrol officers and field operations staff shall be adequately trained in Cultural and Heritage issues and management.<br>◗ A consultation program shall be implemented to help facilitate discussions between traditional owners, community groups, regulatory authorities, and relevant stakeholders. |
| Performance Measures | ◗ Zero complaints from traditional owners, regulatory authorities, community groups or relevant stakeholders.<br>◗ No disturbance to heritage or cultural sites. |
| Monitoring / Auditing / Reporting | ◗ Monitoring during construction, operation or maintenance activities.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Regulatory legislation.<br>◗ Project Environmental Assessments (detail heritage locations from database searches). |

| 8. Community and Social Impact | |
|---|---|
| Goals | To foster positive relationships with local communities and avoid negative impacts, including on visual amenity, traffic and local businesses. |
| Responsibility | Land and Approvals Manager |
| Performance Objective | ◗ To engage interested parties in consultation at all stages.<br>◗ To manage vehicle traffic to minimise disruption to local traffic flows.<br>◗ To use local suppliers and businesses wherever possible.<br>◗ Design permanent infrastructure such that there is no impact on visual amenity. |
| Mitigation Measures | ◗ Development of relationships with local interest groups.<br>◗ Implementation of a stakeholder consultation plan.<br>◗ Minimising vehicle movements, particularly on routes of high flow or at peak times.<br>◗ Using local suppliers and businesses wherever possible.<br>◗ Planning and designing permanent infrastructure with consideration for existing visual amenity. |
| Performance Measures | ◗ Regular presentations to local councils and interest groups to update community on project progress.<br>◗ Zero complaints from local residents about traffic disruptions.<br>◗ No loss of visual amenity. |
| Monitoring / Auditing / Reporting | ◗ Monitoring of community relationship by Land and Approvals Manager, including consideration of ways in which consultation with all interest groups can be improved.<br>◗ Reporting of all complaints and community consultation. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of any complaints will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Stakeholder Consultation Plan (under development). |

| 9. Waste Management | |
|---|---|
| Goals | To operate more efficiently and thereby reduce waste outputs; to recycle and reuse materials where possible; and to dispose of waste materials appropriately. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ To avoid the contamination of soil and water;<br>◗ To minimise potential health risks to workers and the public;<br>◗ To minimise adverse effects on native vegetation and wildlife. |
| Mitigation Measures | ◗ Development and implementation of detailed waste management procedures.<br>◗ Management measures for solid waste materials such as timber, pallets, drums, plastic, glass, metal and rubber to include:<br>▪ stockpiling reusable and recyclable materials such as pallets, timber skids, drums, and scrap metals;<br>▪ installation of designated bins at all sites for aluminium cans, glass, and paper; and<br>▪ disposal of general refuse at approved local authority landfill sites.<br>◗ Disposal of hazardous wastes such as waste oils or chemicals shall be in accordance with the relevant regulatory requirement. Management measures should include-:<br>▪ provision of a designated safe storage area for wastes prior to their collection and transport to an offsite facility for either reuse, recycling, treatment, or disposal. The facility is to be approved by the relevant local authority; and<br>▪ appropriate design measures for storage areas to prevent any spills to the local environment.<br>◗ Sewerage disposal should be either an approved septic system or mobile chemical treatment systems.<br>◗ Management procedures for the disposal of general refuse, such as food scraps, domestic garbage, and commercial waste, should include-:<br>▪ collection and transport to an approved local authority landfill site;<br>▪ on site disposal at camp or work sites should only be considered for remote sites, providing approval from the relevant local authority has been granted or if storage of the refuse poses a health risk;<br>▪ site facilities to be maintained to an orderly and hygienic standard; and<br>▪ litter bins to be provided at all sites and regular site maintenance to be conducted to ensure litter accumulation is avoided. |
| Performance Measures | ◗ Re-use and recycling program being maintained.<br>◗ Site facilities are kept clean. |
| Monitoring / Auditing / | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations |

| 9. Waste Management | |
|---|---|
| Reporting | and corrective actions.<br>◗ Monitoring on a regular basis by all staff. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Waste Minimisation & Disposal<br>◗ Waste Management Checklist |

| 10. Fuel and Chemical Storage and Spills | |
|---|---|
| Goals | To minimise risk of a fuel or chemical spill and minimise environmental impacts should a spill occur. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ To avoid any fuel or chemical spills;<br>◗ To avoid unacceptable safety hazards;<br>◗ To prevent the contamination of soil and water; and<br>◗ To minimise atmospheric emissions. |
| Mitigation Measures | ◗ The storage and handling of fuels and chemicals shall be in accordance with AS 1940:1993 – *The storage and handling of flammable and combustible materials* and relevant legislation.<br>◗ When purchasing chemicals, the material safety data sheets (MSDS) should also be obtained and made available on site to personnel. Personnel handling chemicals shall be appropriately trained and provided with the necessary personal protective equipment.<br>◗ Chemical use should be minimised and only a practicable amount of chemicals shall be stored on site.<br>◗ Appropriate design measures for storage areas, such as bunding and grease traps, to be employed to prevent any spills from being released into the local environment.<br>◗ Appropriate handling procedures for fuels and chemicals should be developed to help prevent spills to the local environment.<br>◗ Fuels and chemicals should not be stored or handled in the vicinity of waterways or creeks where possible.<br>◗ Workforce training shall be provided for fuel and chemical handling and spill response and recovery procedures. |
| Performance Measures | ◗ Zero fuel or chemical spills to the local environment. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions.<br>◗ Monitoring on a regular basis by all staff. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ AS 1940:1993 – *The storage and handling of flammable and combustible materials*<br>◗ Control of Hazardous Substances (General)<br>◗ Control of Hazardous Substances (Solvents & Flammables) |

| 11. Noise and Vibration | |
|---|---|
| Goals | To ensure that noise from well construction and operation is within acceptable limits at adjacent residential premises and other noise sensitive receptors. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise the level and time of noise disturbance. |
| Mitigation Measures | ◗ Local residents shall receive adequate notice of potential noise incursions.<br>◗ Heavy traffic use of local roads will be restricted to the hours of 6 am to 6 pm Monday to Saturday.<br>◗ Construction camp stores and stockpiles shall be located as far as possible from noise sensitive areas.<br>◗ Where practicable, excessively noisy construction activities (fraccing) shall be scheduled for periods which are less likely to result in a noise nuisance.<br>◗ Construction equipment shall be equipped with appropriate noise abatement devices.<br>◗ Noise generating equipment shall be located at appropriate distances from residences and/or will be enclosed or screened if necessary.<br>◗ Noise Abatement procedures will be undertaken in accordance with Section 3 of the EPP Noise 1997.<br>◗ If required, blasting shall be undertaken in accordance with criteria for reasonable noise from Schedule 2 of the EPP Noise 1997. |
| Performance Measures | ◗ Zero noise related complaints received during construction. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions.<br>◗ In response to noise complaints, noise monitoring will be undertaken at locations close to where the activities are occurring. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale.<br>◗ Complaints received about noise and will be investigated within 24 hours and, if required, operating activities will be modified to reduce noise impacts. |
| Associated Documents | ◗ Noise Control |

| 12. Clearing and Grading | |
|---|---|
| Goals | To ensure successful vegetation rehabilitation through topsoil management and to minimise the impact to ecological communities from the clearing of vegetation. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise disturbance of flora and fauna habitats.<br>◗ Avoid adverse impacts on cultural and heritage sites.<br>◗ Optimise the success of vegetation rehabilitation.<br>◗ Minimise soil erosion and degradation.<br>◗ Minimise the risk of weeds spreading.<br>◗ Minimise impact on visual amenity.<br>◗ Minimise modification to surface water flows (drainage lines) and water quality.<br>◗ Minimise disruption to landholders and third parties.<br>◗ Minimise erosion due to disturbance of sodic soils. |
| Mitigation Measures | ◗ Conduct searches of the EPA Contaminated Sites Register prior to construction.<br>◗ Known EPA Contaminated Sites to be avoided.<br>◗ No clearing outside of designated well and pipeline construction areas.<br>◗ No clearing of remnant vegetation or protected species for access tracks or temporary work space.<br>◗ Reduction in clearing through sensitive environments will be marked clearly on alignment sheets and in the field.<br>◗ Permits must be obtained prior to any clearing being conducted.<br>◗ Cleared vegetation will be stored (not burnt) for respreading during re-instatement.<br>◗ Cleared vegetation or soil is not to be pushed up against trees or stored against fencelines.<br>◗ Erosion control measures will be installed where appropriate to minimise topsoil loss.<br>◗ Topsoil depth removal will be typically be 20 – 30 cm. In areas of agricultural cropping this will be increased to 40 - 50 cm.<br>◗ Topsoil will be stored above the potential floodline, particularly at water courses and known flooding areas.<br>◗ Special consideration will be given to the handling of sodic soils to ensure that they are exposed for as short a time as practicable to minimise potential erosion impacts. |
| Performance Measures | ◗ Topsoil and vegetation to be removed and stored appropriately to allow for successful reinstatement.<br>◗ No damage to flora and fauna from unapproved or unplanned vegetation clearing.<br>◗ Erosion control measures installed during clear and grade. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |

| 12. Clearing and Grading | |
|---|---|
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Right of Way Clearing & Grading |

| 13. Drilling, Perforation and Fraccing | |
|---|---|
| Goals | To avoid impacts on the local environment, including on vegetation, soils and surface and ground water, from drilling and associated activities; and to minimise associated noise impacts and air emissions. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise disturbance of flora and fauna habitats.<br>◗ Minimise noise impacts during well construction.<br>◗ Minimise impacts on local soil environment from vehicle movement and pad construction.<br>◗ Minimise impacts on local surface waters associated with well construction.<br>◗ Minimise risk of contamination of groundwater. |
| Mitigation Measures | ◗ Observance of all relevant Procedures as described above to minimise risks associated with erosion and soil stability, ground and surface water contamination, noise impacts, air emissions, waste and fuel and chemical management, and vegetation and weed management,<br>◗ Observance of detailed Drilling and Testing EMP, which is to be available in the Site Office. |
| Performance Measures | ◗ Zero complaints relating to noise from local residences.<br>◗ No contamination of surface or ground water, or local soil environments.<br>◗ Successful restoration of drill pads at completion of construction activities. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Drilling and Testing EMP |

| 14. Pond Construction | |
|---|---|
| Goals | To avoid impacts on the local environment, including on vegetation, soils and surface and ground water, from construction of produced water storages. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise impacts associated with construction of produced water ("turkey's nest") storages. |
| Mitigation Measures | ◗ Observance of all relevant EMPs as described above to minimise risks associated with erosion and soil stability, ground and surface water contamination, noise impacts, air emissions, waste and fuel and chemical management, and vegetation and weed management,<br>◗ Design and construction of storages based on engineering specifications to minimise environmental impacts, including:<br>▪ storage capacity to take into consideration probable water production rate as well as climate conditions, in order to minimise risk of spillage;<br>▪ installation of geomembrane liner to eliminate leaching;<br>▪ inclusion of spillway to facilitate safe spillage during exceptional conditions;<br>▪ operational guidelines to minimise risk of spillage; and<br>▪ cut-and-fill construction techniques to avoid the need to import soil from other sites. |
| Performance Measures | ◗ No soil erosion or air emissions.<br>◗ No contamination of surface or ground water, or local soil environments.<br>◗ Successful operation of water storages such that there are no spills to the environment. |
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Conceptual Design and Specifications for Produced Water Storages. |

| **15. Trenching** | |
|---|---|
| Goals | To reduce the impact of trenching on the topsoil quality, native fauna, domestic stock and agricultural production of the land. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise risk of topsoil and subsoil mixing.<br>◗ Successful rehabilitation of native vegetation and agricultural cropping.<br>◗ Minimise disruption to landholders and other stakeholders.<br>◗ Avoid damage to third party buried infrastructure. |
| Mitigation Measures | ◗ Trenching is to be undertaken as per agreed specifications.<br>◗ Third Party infrastructure will be identified and accurately shown on alignment sheets and marked in the field prior to trenching.<br>◗ Trenching Supervisor and Superintendent will be instructed of the procedure if a previously unidentified contaminated site is uncovered during construction. This includes:<br>– Stopping trenching at the location;<br>– Relocation and starting trenching 50 m ahead;<br>– Advising the Operations Manager and Land and Approvals Manager;<br>– Instigating site assessment according to EPA;<br>– Instigating actions according to the assessment. This may include remediation of the site or movement of the pipeline alignment to avoid the site.<br>◗ Trench spoil (subsoil) is to be separated from the topsoil.<br>◗ Subsoil will be stored above the potential floodline, particularly at water courses and known flooding areas. Erosion control measures will be installed where appropriate to minimise erosion risk.<br>◗ All major roads will be bored.<br>◗ If an open cut crossing of a road or track is necessary, consultation will be undertaken with landholders and third parties. Detours and signage will be installed as required.<br>◗ Where appropriate, gaps in the topsoil will be provided, and subsoil and vegetation stockpiled to assist the movement of livestock and native fauna.<br>◗ Where appropriate, gaps in soil stockpiles and resultant backfill mounds will be provided to mitigate the potential impact of overland flow that is not parallel to the backfill mounds.<br>◗ The trench will be left open for the minimum period practical. It will not be left open for extended periods on slopes leading to a watercourse or drainage line.<br>◗ Native fauna ramps shall be installed at the ends of trenching (at least every 1 km), and at each normal break e.g. road and water crossing. |
| Performance Measures | ◗ Disruption to landholders and third parties to be minimised.<br>◗ Trench spoil (subsoil) and topsoil to be separated.<br>◗ Trench plugs and erosion mitigation measures implemented to reduce the risk of erosion.<br>◗ Ramps to be installed at trench breaks and appropriate locations. |
| Monitoring / Auditing / | ◗ During construction, the work areas will be regularly inspected to assess the implementation of the construction mitigation management |

| 15. Trenching | |
|---|---|
| Reporting | procedure.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Trenching<br>◗ Road Crossings Open Cut |

| 16. Pipe Stringing and Welding | |
|---|---|
| Goals | To reduce the impact of stringing and welding on landholders and the environment. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise the disturbance to landholders and third parties.<br>◗ Minimise the risk of bushfire.<br>◗ Ensure that native fauna and livestock have access across the pipeline. |
| Mitigation Measures | ◗ Trucks delivering pipe shall be scheduled during daylight hours and along designated access roads to minimise noise and dust impacts.<br>◗ All pipeline packaging and welding waste shall be removed from site to an approved disposal facility.<br>◗ When the pipe is strung, ensure gaps are left to allow access for native fauna and livestock. The gaps shall be aligned with access tracks, stored vegetation and topsoil, fences and gates.<br>◗ Pipeline caps shall be placed over the ends of the pipe to prevent dust and wildlife from getting in.<br>◗ During welding, the following pre-cautions will minimise the risk of starting bushfires:<br>– Working area shall be cleared of vegetation;<br>– Welding trucks shall be equipped with a fire fighting unit with adequate water storage capacity and fire extinguishers. Welding crews shall be trained in the use of the fire fighting equipment; and<br>– Water trucks (used for dust suppression) shall be available with water storage capacity in the event of a fire. |
| Performance Measures | ◗ Disruption to landholders and third parties is minimised.<br>◗ Native fauna and livestock have areas where they can cross the easement.<br>◗ No uncontrolled fires to be started. |
| Monitoring / Auditing / Reporting | ◗ During construction, the work areas will be regularly inspected to access the implementation of construction mitigation management procedures.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Pipeline Stringing & Welding |

| 17. Pipe laying and Backfilling | |
|---|---|
| Goals | To reduce the impact of pipe laying and backfilling on the environment. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise the disturbance to landholders and third parties.<br>◗ Minimise the risk of topsoil and subsoil mixing.<br>◗ Ensure that native fauna and livestock have access across the pipeline. |
| Mitigation Measures | ◗ Erosion berms will be constructed on slopes to divert rainfall away from the alignment.<br>◗ Compaction over the working area will be ripped prior to re-spreading of topsoil.<br>◗ Trench plugs to be provided and backfilled soils compacted along the trench to prevent erosion along backfilled trench.<br>◗ A small crown shall be left over the backfilled trench to allow for settling. Breaks of the crown shall be provided to allow for water flow across the alignment at regular points. These breaks shall be determined using the overland flowpaths developed by the relevant authority.<br>◗ Pipeline markers will be installed according to land use to locate the pipeline.<br>◗ Topsoil will only be respread over the working area following the backfilling of all subsoil. Topsoil will not be used as padding material.<br>◗ In areas of particularly sodic soil, special precautions will be taken to ensure that topsoil and sodic subsoil is not mixed. In addition, these areas will be backfilled at a quicker rate to ensure minimal exposure time for highly erodible soils. Sodic soils will be placed at the base of the trench to further limit exposure.<br>◗ Obvious low-lying floodways will be identified during the pipeline route survey process to identify those areas requiring a management of floodway strategy to be developed and applied in order to mitigate potential erosion impacts.<br>◗ At the start of each day, any exposed trench shall be inspected for the presence of wildlife and, if found, it should be appropriately removed.<br>◗ The ends of exposed pipe shall be sealed at the end of each day.<br>◗ At the end of each day, no extensive lengths of trench shall be left exposed. |
| Performance Measures | ◗ Subsoil returned to the trench prior to topsoil.<br>◗ Appropriate erosion berms to be installed on sloped areas. |
| Monitoring / Auditing / Reporting | ◗ During construction, the work areas will be regularly inspected to access the implementation of construction mitigation management procedures.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Pipeline Laying & Backfilling<br>◗ Backfill & Reinstatement Gas Pipelines |

| 18. Hydrotesting | |
|---|---|
| Goals | To minimise all impacts associated with hydrostatic testing on the surrounding soil and water environments. |
| Responsibility | Operations Manager |
| Performance Objective | ◗ Minimise impacts to soils, groundwater and general water quality.<br>◗ Minimise the amount of water used.<br>◗ Minimise the risk of soil erosion. |
| Mitigation Measures | ◗ If water quality is sufficient, water will be sourced from existing storages within the production field.<br>◗ If another source of water is required, it shall be approved in advance by the Environment and Land Manager.<br>◗ All permits to source water shall be approved in advance.<br>◗ Biodegradable biocides shall be selected where possible.<br>◗ Ensure there is no damage from discharge of the water.<br>◗ All additional approvals from landholders and for water disposal options.<br>◗ Where sufficient water is not available it will be trucked in as required.<br>◗ Water quality testing procedures and values will be approved prior to discharge by the Environment and Land Manager.<br>◗ Prior to discharge, the Land and Approvals Manager shall be consulted about the water quality and testing required, and consult with Council and relevant authorities.<br>◗ Discharge hydrotest water to land to avoid runoff to creeks, agricultural drainage lines, erosion or flooding. At the discharge point materials shall be used to reduce the force and to dissipate the water to avoid soil erosion. |
| Performance Measures | ◗ Testing Procedures will be in accordance with AS 2885.<br>◗ Discharge will be within all regulatory and landholder requirements. |
| Monitoring / Auditing / Reporting | ◗ Monitor test water discharges from the site to ensure compliance with water standards.<br>◗ During construction, the work areas will be regularly inspected to access the implementation of construction mitigation management procedures.<br>◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions. |
| Corrective Action | ◗ Should the disposal of hydro-test waters fail to meet the performance criteria the Construction Contractor will review disposal options.<br>◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale. |
| Associated Documents | ◗ Pipeline Testing & Commissioning |

| 19. Clean Up and Rehabilitation | |
|---|---|
| Goals | To rehabilitate all disturbed areas to a land use capability compatible with the surrounding land use. Any rehabilitation will utilise all actable methods to ensure that a stable land form is reinstated. |
| Responsibility | Land and Approvals Manager |
| Performance Objective | ◗ Minimise loss of vegetation and habitat;<br>◗ Minimise erosion and sediment runoff;<br>◗ Minimise the risk of subsidence;<br>◗ Minimise the loss of visual amenity;<br>◗ Minimise the modification of drainage patterns; and<br>◗ Minimise the damage to any infrastructure. |
| Mitigation Measures | ◗ Minor surface roughness will be encouraged when spreading topsoil to trap water and seed.<br>◗ Other cleared vegetation will be removed and disposed of in consultation with the appropriate landholder or respread over cleared areas to assist in seed distribution and provide shelter for fauna.<br>◗ Areas affected by operations and development will be re-profiled to original and stable contours, re-establishing surface drainage lines and other land features.<br>◗ Erosion and sediment controls will be installed if necessary. Existing soil erosion measures will be reinstated to a condition at least equal to the pre-existing state.<br>◗ Above-ground infrastructure shall be fenced to discourage third party, stock and wildlife entry.<br>◗ Signs, fences or other barriers shall be installed where appropriate to prevent unauthorised easement access.<br>◗ Permanent pipeline warning signs shall be erected along easements.<br>◗ In general, revegetation will occur through the re-spreading of cleared topsoil and vegetation. Active revegetation will only occur where stabilisation is required to prevent erosion.<br>◗ Where active revegetation is required, local native species will be selected in preference to introduced.<br>◗ In other areas where seeding or replanting is required, the seed mix will be agreed with the relevant land holder.<br>◗ Environmental features such as rocks and dead timber will be replaced in cleared areas as appropriate.<br>◗ Trees will be permitted to grow within 3m of the pipeline as long as:<br>– pipeline integrity is not affected;<br>– regrowth is considered; and<br>– signage remains visible. |
| Performance Measures | ◗ Land and infrastructure affected by the planning, construction and post construction phases will be restored to pre-disturbance status or better.<br>◗ No new weed species to be introduced.<br>◗ Revegetation shall return areas to similar composition as surrounding vegetation.<br>◗ Drainage patterns returned following construction. |

| 19. Clean Up and Rehabilitation | |
|---|---|
| Monitoring / Auditing / Reporting | ◗ Audits will be conducted in accordance with the Environmental Management Program, with implementation of the recommendations and corrective actions.<br>◗ Monitoring on a regular basis by all staff. |
| Corrective Action | ◗ Investigations/corrective actions undertaken as a result of the audit or regular monitoring will be documented and incorporated into this EMP. Correction actions shall be closed out by senior management according to an agreed responsibility and timescale.<br>◗ Investigate complaints and take all steps to restore area according to land holder requirements. |
| Associated Documents | ◗ Site Clean Up & Clearance<br>◗ Pipeline Clean Up & Rehabilitation |

# Appendix B

## Database Searches

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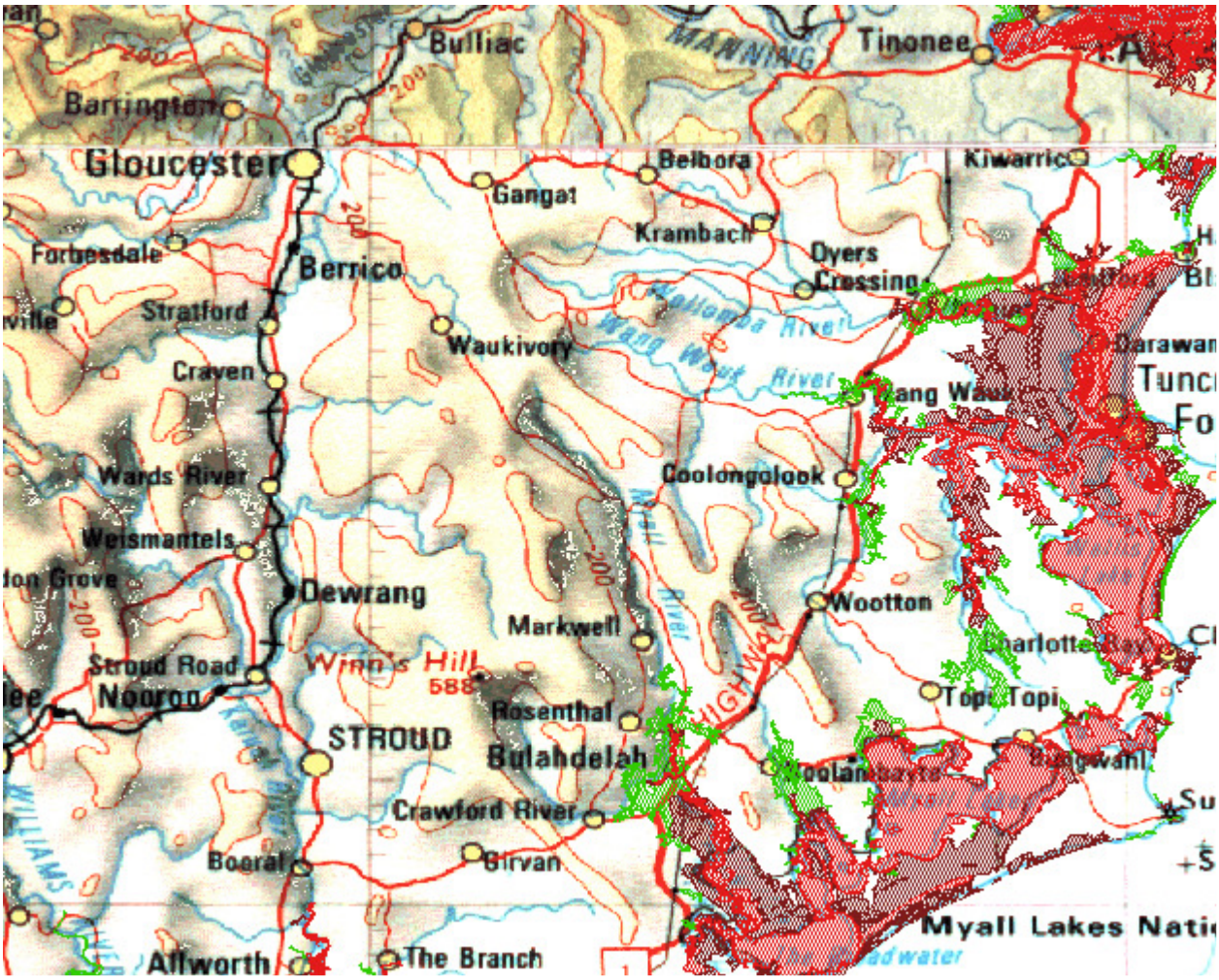
# Map from the NSW Natural Resource Atlas

Map created with NSW Natural Resource Atlas - http://www.nratlas.nsw.gov.au

Monday, July 18, 2011




0 75 Km

## Legend

| Symbol | Layer | Custodian |
|---|---|---|
| High probability of occurrence<br>Low probability of occurrence<br>No known occurrence | Acid sulfate soils risk, coastal NSW | |
| | Topographic base maps (scanned) | |
| Primary/arterial road<br>Motorway/freeway<br>Railway<br>Runway<br>Contour<br>Background | Topographic base map | |

# Gloucester Local Environmental Plan 2010

## Heritage Map - Sheet HER_003

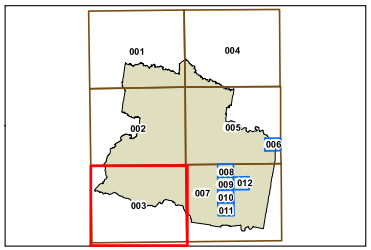
**Heritage**

Heritage Conservation Area

Heritage Item - General

Cadastre

Cadastre 10/12/08 ©Gloucester Council

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Projection: GDA 1994
Zone 56

Map Identification Number:
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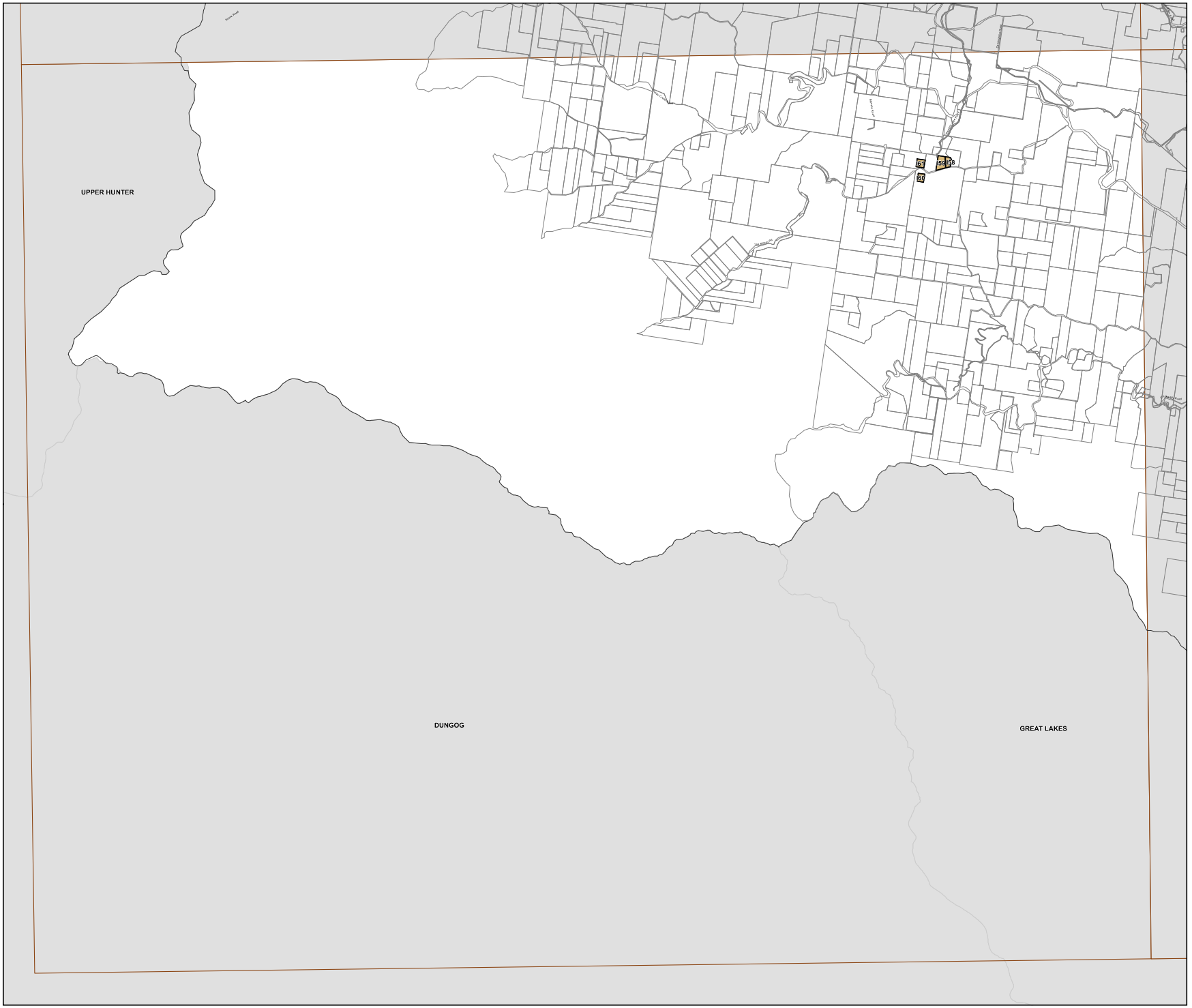


# Gloucester Local Environmental Plan 2010

## Heritage Map - Sheet HER_005

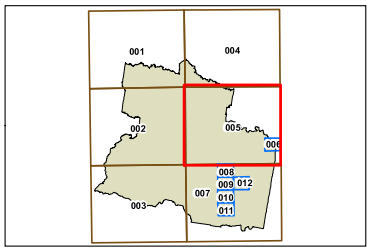
**Heritage**

Heritage Conservation Area

Heritage Item - General

Cadastre

Cadastre 10/12/08 ©Gloucester Council

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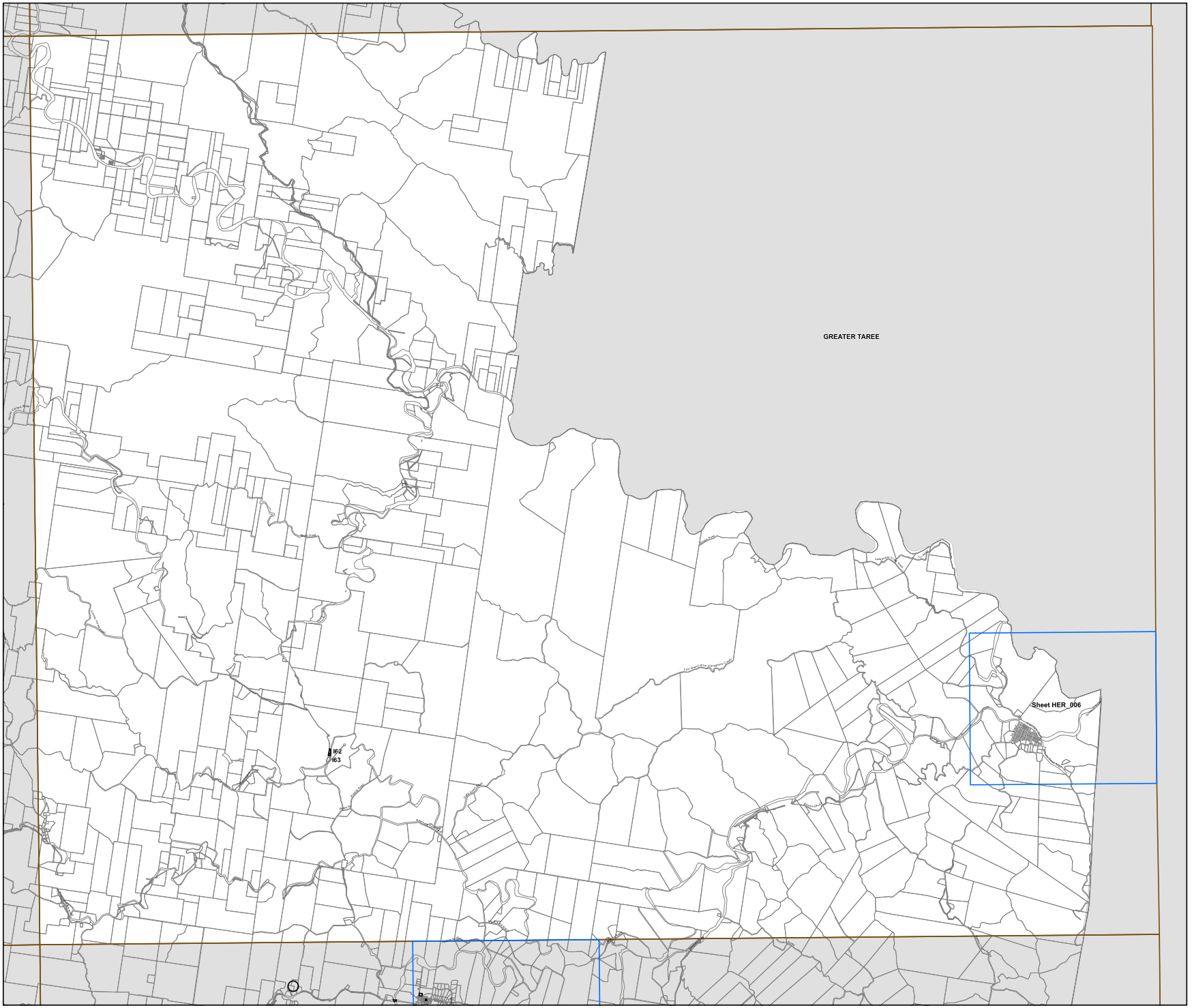


# Gloucester Local Environmental Plan 2010

## Heritage Map - Sheet HER_007

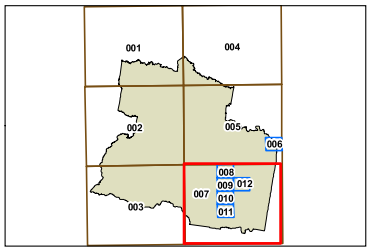
**Heritage**

Heritage Conservation Area

Heritage Item - General

Cadastre

Cadastre 10/12/08 © Gloucester Council

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Projection: GDA 1994 Zone 56

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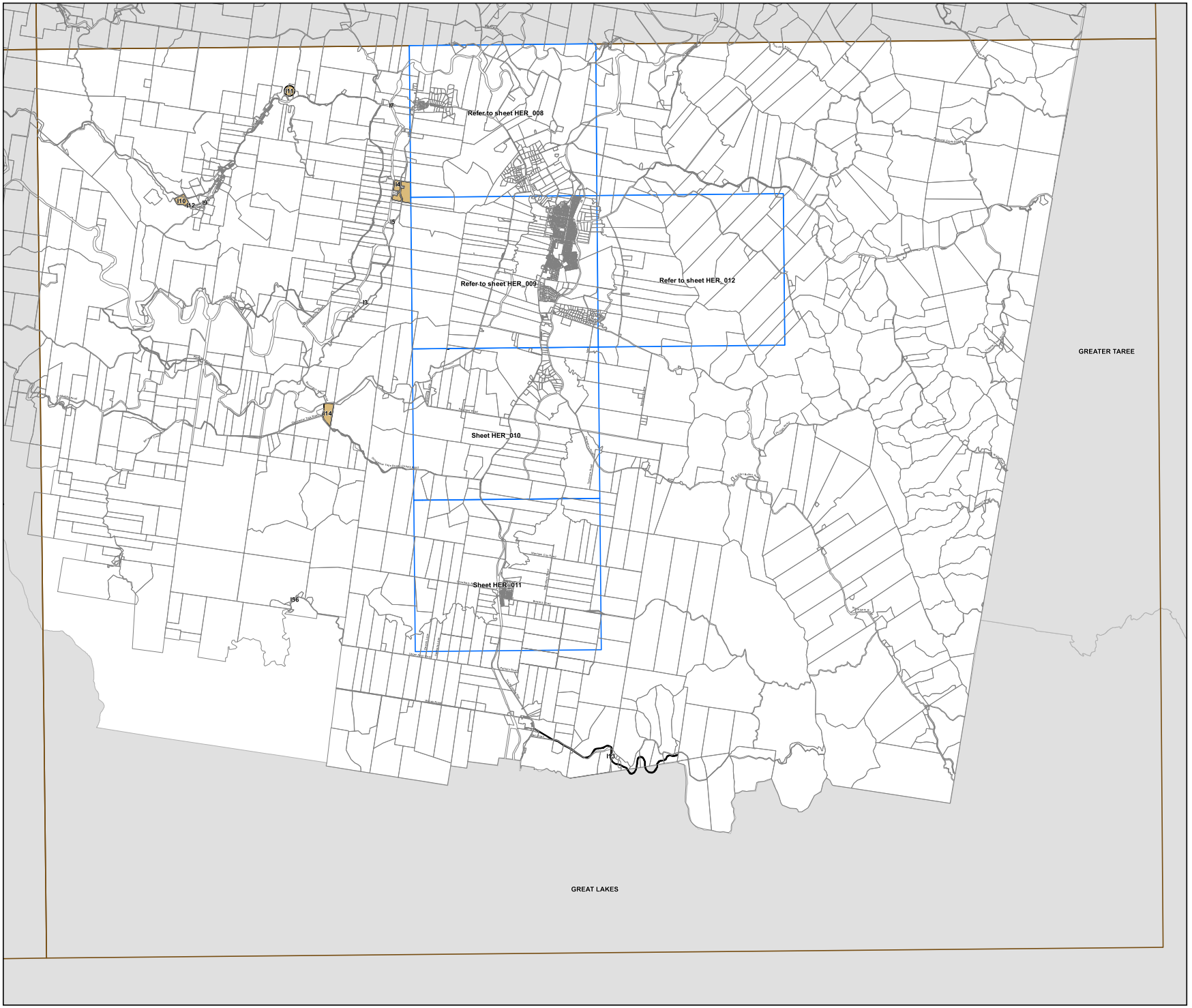


# Gloucester Local Environmental Plan 2010

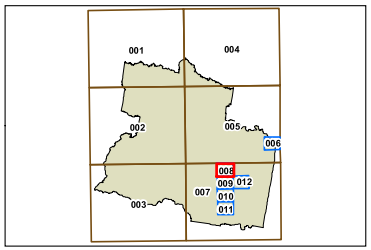
## Heritage Map - Sheet HER_008

**Heritage**

- Heritage Conservation Area
- Heritage Item - General

Cadastre

- Cadastre 10/12/08 © Gloucester Council




N

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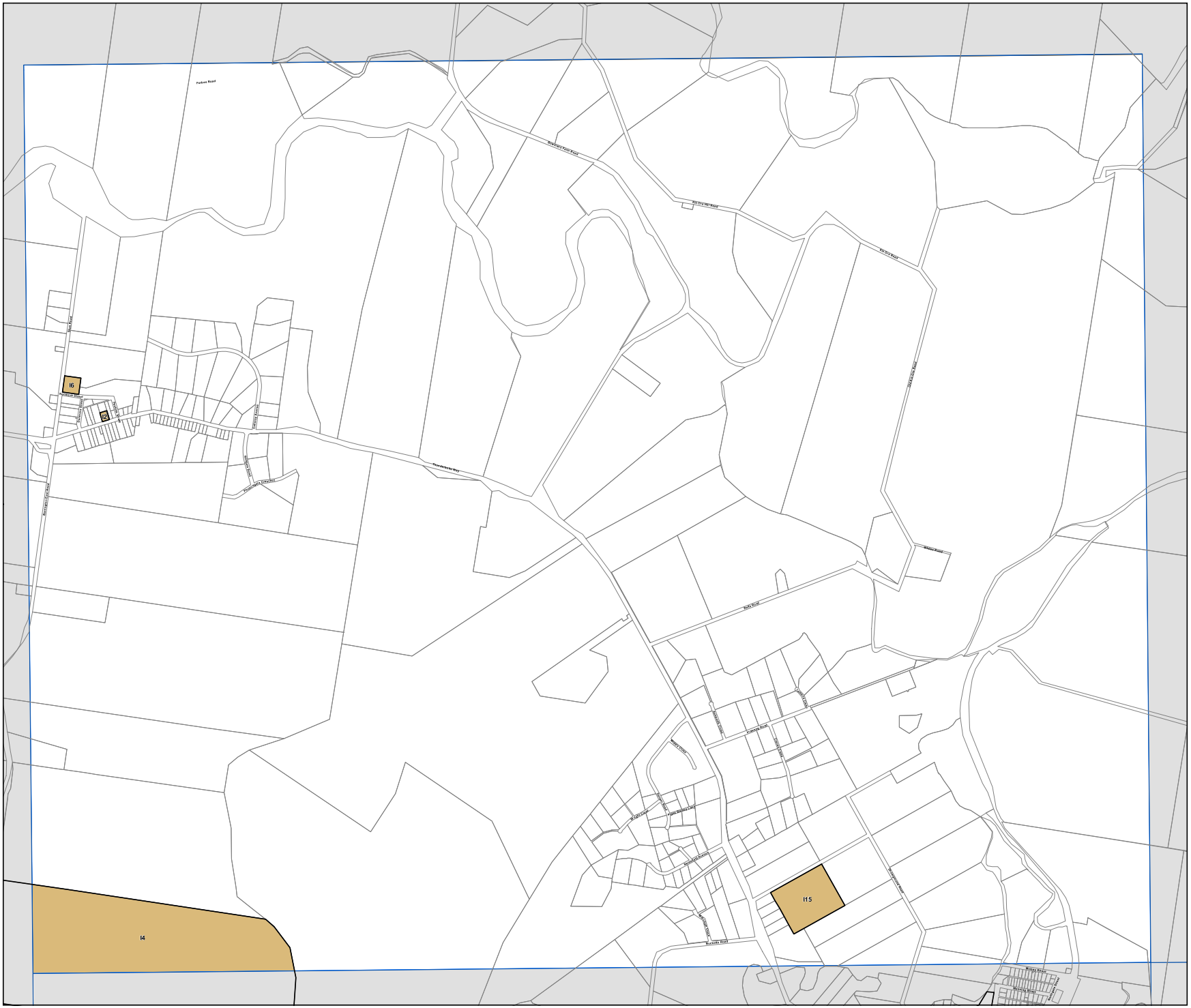
Scale:1:20,000 @ A3

Projection: GDA 1994
Zone 56

Map Identification Number:
3050_COM_HER_008_020_20100517



# Gloucester Local Environmental Plan 2010

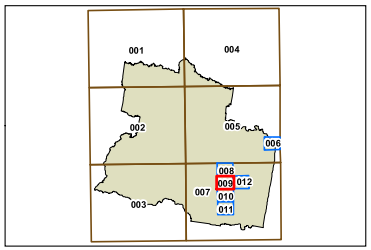
## Heritage Map - Sheet HER_009

**Heritage**

- Heritage Conservation Area
- Heritage Item - General

Cadastre

- Cadastre 10/12/08 © Gloucester Council



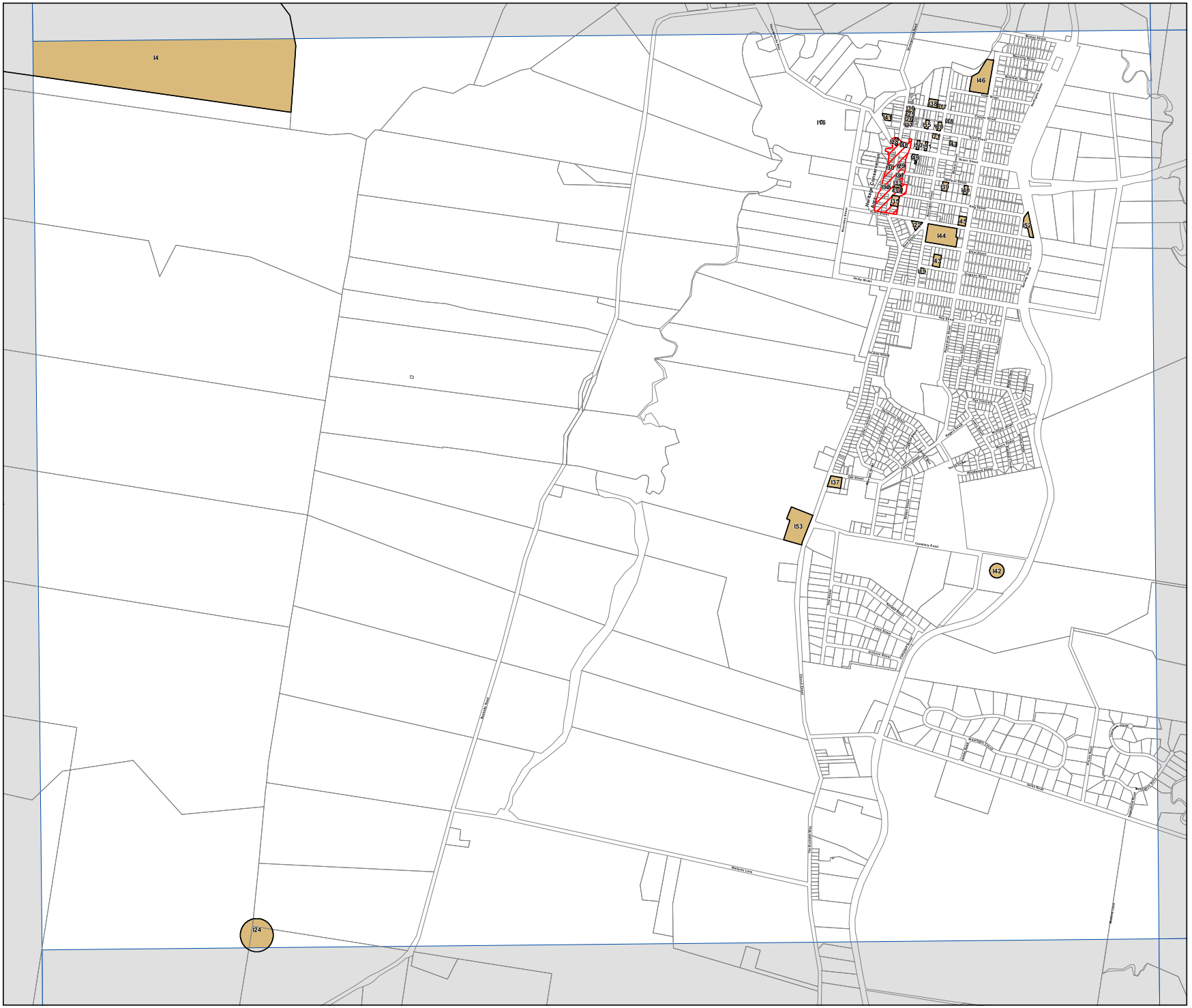

N

0 100 200 300 400 500 Metres

Scale:1:20,000 @ A3

Projection: GDA 1994
Zone 56

Map Identification Number:
3050_COM_HER_009_020_20100517



# Gloucester Local Environmental Plan 2010

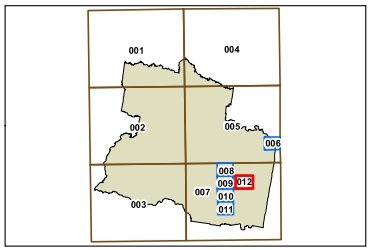
## Heritage Map - Sheet HER_012

**Heritage**

- Heritage Conservation Area
- Heritage Item - General

Cadastre

- Cadastre 10/12/08 © Gloucester Council




N

0 100 200 300 400 500 Metres

Scale:1:20,000 @ A3

Projection: GDA 1994
Zone 56

Map Identification Number:
3050_COM_HER_012_020_20100517

# Gloucester Local Environmental Plan 2010

Current version for 13 July 2011 to date (accessed 18 July 2011 at 10:17)



## Schedule 5 Environmental heritage

(Clause 5.10)

## Part 1 Heritage items

| Suburb | Item name | Address | Property description | Significance | Map Ref |
|---|---|---|---|---|---|
| Barrington | Free Presbyterian Church | Argyle Street | Lot 1, DP 568641 | Local | I2 |
| Barrington | Barrington Pioneer Cemetery | Barrington East Road | Lot 63, DP 753209 | Local | I3 |
| Barrington | Original School Residence | Barrington East Road | Lot 5, DP 1078578 | Local | I4 |
| Barrington | Slab House | 402 Barrington East Road | Lot 11, DP 804895 | Local | I5 |
| Barrington | Barrington Public School, early 1910 | Kenmore Street | Lot 1, DP 798982 | Local | I6 |
| Barrington | Barrington River Bridge | Thunderbolts Way | | Local | I7 |
| Copeland | Cyanide Treatment Works (Rainbow Battery) | Copeland Road | Reserve 210101 | State | I9 |
| Copeland | Mountain Maid Gold Mine | Copeland Road | Lot 124, DP 753147 | State | I12 |
| Copeland | Copeland Tops Forest Preserve, including Hidden Treasure Gold Mine | Scone Road | Lot 124, DP 753147 | Local | I10 |
| Copeland | Copeland No 2 General Cemetery | Scone Road | Lot 771, DP 1984 | Local | I11 |
| Craven | The Glen, Craven Logging Tramline | Glen Road | Lots 284 and 311–314, DP 979573 | Local | I13 |
| Faukland | “Faukland” | Faukland Road | Lot 310, DP 830780 | Local | I14 |
| Gloucester | Gloucester Showground Precinct | Barrington Road | Lot 1, DP 555445 | Local | I15 |
| Gloucester | Gloucester | Barrington | Lot 1, DP | Local | I16 |

| | | | | | |
|---|---|---|---|---|---|
| | Sports Ground Grandstand | Road | 842441 | | |
| Gloucester | Former Presbyterian Church Manse | 7 Barrington Street | Lot 1, DP 513198 | Local | I17 |
| Gloucester | Former Timber Worker's House | Barrington and Cowper Streets | Lot 1, DP 34200 | Local | I18 |
| Gloucester | "Roma" | Barrington and Gregson Streets | Lot 1, DP 743285 | Local | I19 |
| Gloucester | Former "Hillcrest" Hospital | Barrington and Tyrell Streets | Lot 12, DP 1107928 | Local | I20 |
| Gloucester | St Andrew's Presbyterian Church Hall | Barrington and Tyrell Streets | Lot 4, DP 977288 | Local | I21 |
| Gloucester | War Memorial Clock Tower | Bent Street | Lot 1, DP 977288 | Local | I22 |
| Gloucester | Australian Agricultural Company Dam | Bucketts Road | Lots 16 and 17, DP 193003 | Local | I23 |
| Gloucester | Thunderbolt's Cave | Via Bucketts Road | Lot 4, DP 604711 | Local | I24 |
| Gloucester | Gloucester Police Station | 8 Church Street | Lot 11B, DP 977350 | Local | I25 |
| Gloucester | Gloucester Court House | 10 Church Street | Lot 10B, DP 977288 | Local | I26 |
| Gloucester | Original Shire Council Chambers | 12 Church Street | Lot 9, DP 711550 | Local | I27 |
| Gloucester | Former ABC Bank Building | 23 Church Street | Lot 2, DP 515223 | Local | I28 |
| Gloucester | Sellicks Chambers | 42 Church Street | Lot 1, DP 194853 | Local | I29 |
| Gloucester | Westpac Bank | 47 Church Street | Lot 1, DP 212064 | Local | I30 |
| Gloucester | School of Arts | 56 Church Street | Lot 1, DP 328783 | Local | I31 |
| Gloucester | McRae's Building | 73 Church Street | Lot 1, DP 594809 | Local | I32 |
| Gloucester | Majestic Theatre | 78 Church Street | Lot 1, DP 738615 | Local | I33 |
| Gloucester | Avon Valley Inn | 82 Church Street | Lot 125, DP 864391 | Local | I34 |
| Gloucester | Payless Building | 84 Church Street | Lot 1, DP 1103429 | Local | I35 |
| Gloucester | Masonic Temple | Church and Cowper Streets | Lot 12, DP 1006343 | Local | I36 |
| Gloucester | St Clement's Park Historic Site | Church and Oak Streets | Lot 290, DP 1102669 | Local | I37 |
| Gloucester | "Easton's House" | 16 Cowper Street | Lot 2, DP 192505 | Local | I38 |
| Gloucester | Former Sisters of St Joseph | Denison Street | Lot 5, DP 977350 | Local | I39 |

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|---|---|---|---|---|---|
| | Convent | | | | |
| Gloucester | "Gloucester Cottage" | 61 Denison Street | Lot 9, DP 840777 | Local | I40 |
| Gloucester | Federation House | Gardiners Lane | Lot 2, DP 282688 | Local | I41 |
| Gloucester | John McKenzie's Grave | Gloucester Cemetery | Lot 7003, DP 96417 | Local | I42 |
| Gloucester | "Narraweena" | 10 Gregson Street | Lot 1, DP 782859 | Local | I43 |
| Gloucester | Original Gloucester Public School Building | Hume Street | Lot 1, DP 808374 | Local | I44 |
| Gloucester | St Paul's Anglican Church and Rectory | Hume and Ravenshaw Streets | Lot 910, DP 1102514 | Local | I45 |
| Gloucester | Gloucester Main Colliery Site | King George Park Road | Lot 3, DP 842441 | Local | I46 |
| Gloucester | "Fairview", concrete block house | 1 Market Street | Lot 10, DP 977288 | Local | I47 |
| Gloucester | Former Bank of NSW Building | 2 Queen Street | Lot 1, DP 596408 | Local | I48 |
| Gloucester | Gloucester Post Office | 9 Queen Street | Lot 10, DP 776482 | Local | I49 |
| Gloucester | Former CBC Bank Building | 10 Queen Street | Lot 1, DP 798136 | Local | I50 |
| Gloucester | Former Abbots Austioneer's Building | 16 Queen Street | Lot 1, DP 112016 | Local | I51 |
| Gloucester | Gloucester Co-op Dairy Company Factory | Railway Street | Lot 1, DP 851383 | Local | I52 |
| Gloucester | Australian Agricultural Manager's House, formerly "Gloucester Cottage", and outbuildings | The Bucketts Way | Lot 1, DP 782706 | Local | I53 |
| Gloucester | Water Tower | Tyrell Street | Lot 11B, DP 977288 | Local | I54 |
| Gloucester | Second "Hillcrest" Hospital | 16 Tyrell Street | Lot 3, DP 593953 | Local | I55 |
| Gloucester | Disused Upper Avon Road Bridge | Upper Avon Road, Avon State Forest | | Local | I56 |
| Mares Run | "PGK" Survey Peg Mark | Nowendoc Road | | Local | I57 |
| Rawdon Vale | "Airlie" | Rawdon Vale | Lot 7, DP | State | I58 |

| | | | | | |
|---|---|---|---|---|---|
| | | Road | 952430 | | |
| Rawdon Vale | “Bonnie Doon” | Rawdon Vale Road | Lot 8, DP 952430 | Local | I59 |
| Rawdon Vale | “Stobo” | Rawdon Vale Road | Lot 1, DP 82646 | State | I60 |
| Rawdon Vale | “Rawdon Vale” | The Moppy Road | Lot 2, DP 168910 | Local | I61 |
| Rookhurst | Original Public School Building | Thunderbolts Way | Lot 32, DP 753159 | Local | I62 |
| Rookhurst | Presbyterian Church | Thunderbolts Way | Lot 32, DP 753159 | Local | I63 |
| Waukivory | Avon Valley Colliery Site | Waukivory Road | | Local | I64 |

## Part 2 Heritage conservation areas

| **Name of heritage conservation area** | **Identification on Heritage Map** |
|---|---|
| Gloucester Main Street Precinct | Shown as “Heritage Conservation Area” |

Top of page

# Search Results

**12 results found.**

| | | |
|---|---|---|
| Barrington Tops National Park (1978 boundary) Salisbury Rd | Dungog, NSW, Australia | (Registered) Register of the National Estate |
| Barrington Tops Wilderness Area Salisbury Rd | Dungog, NSW, Australia | (Indicative Place) Register of the National Estate |
| Camels Hump Nature Reserve Barrington Rd | Bretti, NSW, Australia | (Registered) Register of the National Estate |
| Folk Museum 12 Church St | Gloucester, NSW, Australia | (Registered) Register of the National Estate |
| Gloucester Cottage The Bucketts Way | Gloucester, NSW, Australia | (Registered) Register of the National Estate |
| Gloucester Showground Barrington Rd | Gloucester, NSW, Australia | (Indicative Place) Register of the National Estate |
| Gloucester Soldiers Memorial Bent St | Gloucester, NSW, Australia | (Indicative Place) Register of the National Estate |
| Gondwana Rainforests of Australia | Lismore, NSW, Australia | (Declared property) World Heritage List |
| Gondwana Rainforests of Australia | Lismore, NSW, Australia | (Listed place) National Heritage List |
| The Stroud Gloucester Valley Bucketts Way | Gloucester, NSW, Australia | (Nominated place) National Heritage List |
| Vale of Gloucester Bucketts Way | Gloucester, NSW, Australia | (Indicative Place) Register of the National Estate |
| Woko National Park (1991 boundary) Thunderbolts Way | Bretti, NSW, Australia | (Registered) Register of the National Estate |

**Report Produced: Mon Jul 18 17:02:39 2011**

# Search Results

**49 results found.**

| | | |
|---|---|---|
| Alum Mountain Geological Site 1 | Bulahdelah, NSW, Australia | (Registered) Register of the National Estate |
| Bandicoot Island Nature Reserve | Forster, NSW, Australia | (Registered) Register of the National Estate |
| Big and Little Seal Grey Nurse Shark Habitat | Seal Rocks, NSW, Australia | (Place rejected for Emergency Listing) National Heritage List |
| Boondelbah Nature Reserve | Hawks Nest, NSW, Australia | (Registered) Register of the National Estate |
| Booral House Lowes La | Booral, NSW, Australia | (Registered) Register of the National Estate |
| Bulahdelah Courthouse (former) Ann St | Bulahdelah, NSW, Australia | (Registered) Register of the National Estate |
| Bulahdelah Showground Prince St | Bulahdelah, NSW, Australia | (Indicative Place) Register of the National Estate |
| Cape Hawke Coastal Area Cape Hawke Dr | Forster, NSW, Australia | (Registered) Register of the National Estate |
| Carrington Cemetery Tahlee Rd | Carrington, NSW, Australia | (Registered) Register of the National Estate |
| Coolongolook Nature Reserve | Coolongolook, NSW, Australia | (Registered) Register of the National Estate |
| Corrie Island Limekilns Rd | Tea Gardens, NSW, Australia | (Registered) Register of the National Estate |
| Gundayne and Outbuildings The Bucketts Way | Booral, NSW, Australia | (Registered) Register of the National Estate |
| Indigenous Place | Hawks Nest, NSW, Australia | (Registered) Register of the National Estate |
| Indigenous Place | Seal Rocks, NSW, Australia | (Registered) Register of the National Estate |
| John Gould Island Nature Reserve | Hawks Nest, NSW, Australia | (Registered) Register of the National Estate |

| | | |
|---|---|---|
| Karuah River Road Bridge Weismantels-Dingadee Rd | Monkerai, NSW, Australia | (Registered) Register of the National Estate |
| Little Broughton Island Grey Nurse Shark Habitat | Shoal Bay, NSW, Australia | (Place rejected for Emergency Listing) National Heritage List |
| Little Broughton Island Nature Reserve | Hawks Nest, NSW, Australia | (Registered) Register of the National Estate |
| Mills Island Nature Reserve | Forster, NSW, Australia | (Registered) Register of the National Estate |
| Myall Lakes National Park Pacific Hwy | Bulahdelah, NSW, Australia | (Registered) Register of the National Estate |
| Pinnacle Grey Nurse Shark Habitat | Forster, NSW, Australia | (Place rejected for Emergency Listing) National Heritage List |
| Port Stephens | Nelson Bay, NSW, Australia | (Indicative Place) Register of the National Estate |
| Port Stephens Estuary | Nelson Bay, NSW, Australia | (Registered) Register of the National Estate |
| Public School and Headmasters Residence Erin St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Quambi Broadway St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Regatta Island Nature Reserve | Forster, NSW, Australia | (Registered) Register of the National Estate |
| Seal Rocks Littoral Rainforest Seal Rocks Rd | Seal Rocks, NSW, Australia | (Registered) Register of the National Estate |
| Seal Rocks Nature Reserve | Seal Rocks, NSW, Australia | (Registered) Register of the National Estate |
| Seal Rocks and Surrounding Area Seal Rocks Rd | Seal Rocks, NSW, Australia | (Indicative Place) Register of the National Estate |
| St John the Evangelist Anglican Church & Cemetery Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| St John the Evangelist Anglican Church Group Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |

| | | |
|---|---|---|
| St Johns Anglican Rectory Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| St Johns Parish Hall Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Stormpetrel Nature Reserve | Hawks Nest, NSW, Australia | (Registered) Register of the National Estate |
| Stroud Conservation Area | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Stroud Courthouse (former) Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Stroud House 42 Cowper St | Stroud, NSW, Australia | (Registered) Register of the National Estate |
| Stroud Showground & Grandstand Trunk Rd | Stroud, NSW, Australia | (Indicative Place) Register of the National Estate |
| Sugarloaf Point Lighthouse Seal Rocks Rd | Seal Rocks, NSW, Australia | (Listed place) Commonwealth Heritage List |
| Sugarloaf Point Lighthouse (Commonwealth) Seal Rocks Rd | Seal Rocks, NSW, Australia | (Registered) Register of the National Estate |
| Sugarloaf Point Lightstation Seal Rocks Rd | Seal Rocks, NSW, Australia | (Registered) Register of the National Estate |
| Tahlee House Grounds, Structures and Outbuildings Tahlee Rd | Carrington, NSW, Australia | (Registered) Register of the National Estate |
| Tahlee House Group Tahlee Rd | Carrington, NSW, Australia | (Registered) Register of the National Estate |
| Tahlee House Reception and Ballroom Wing Tahlee Rd | Carrington, NSW, Australia | (Registered) Register of the National Estate |
| Tea Gardens Wetland Myall St | Tea Gardens, NSW, Australia | (Indicative Place) Register of the National Estate |
| Wallamba District Showground Nabiac St | Nabiac, NSW, Australia | (Indicative Place) Register of the National Estate |
| Wallis Island Nature Reserve | Forster, NSW, Australia | (Registered) Register of the National Estate |

| | | |
|---|---|---|
| Wallis Lake The Lakes Way | Forster, NSW, Australia | (Indicative Place) Register of the National Estate |
| Yahoo Island Nature Reserve | Forster, NSW, Australia | (Registered) Register of the National Estate |

**Report Produced: Mon Jul 18 17:03:18 2011**

Click on the BACK button of your browser to return to the search.

# Statutory Listed Items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into two sections.

- **Section 1**. contains items listed by the **Heritage Council** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Branch.
- **Section 2**. contains items listed by **Local Councils & Shires and State Government Agencies**. This section may also contain additional information on some of the items listed in the first section.

## Section 1. Items listed under the NSW Heritage Act.

Click on an item name to view the full details.
The search results can be re-sorted by clicking on the **(sort)** option at the top of each column.

| Item Name (sort) | Address (sort) | Suburb (sort) | LGA (sort) | Listed Under Heritage Act |
|---|---|---|---|---|
| Gondwana Rainforests of Australia | | Various | Upper Hunter | Yes |

There was 1 record in this section matching your search criteria.

## Section 2. Items listed by Local Government and State agencies.

| Item Name (sort) | Address (sort) | Suburb (sort) | LGA (sort) | Information Source (sort) |
|---|---|---|---|---|
| Abbotts Auctioneers Building, Former | 16 Queen Street | Gloucester | Gloucester | LGOV |
| ABC Bank Building, Former | 23 Church Street | Glocester | Gloucester | LGOV |
| Airlie | Rawdon Vale Road | Rawdon | Gloucester | LGOV |
| Australian Agricultural Company Dam | Bucketts Street | Gloucester | Gloucester | LGOV |
| Australian Agricultural Company Managers House | Bucketts Way | Gloucester | Gloucester | LGOV |
| Avon Valley Inn | 82 Church Street | Gloucester | Gloucester | LGOV |
| Bank Of NSW Building, Former | 2 Queen Street | Gloucester | Gloucester | LGOV |
| Barrington Bridge Over Barrington River | Walcha Road | Gloucester | Gloucester | SGOV |
| Barrington House | | Barrington | Gloucester | LGOV |
| | | Barrington East | | |

| | | | | |
|---|---|---|---|---|
| **Barrington Pioneer Cemetery** | Road | Barrington | Gloucester | LGOV |
| **Barrington Public School Building Early (1910)** | | Barrington | Gloucester | LGOV |
| **Barrington Rover Bridge** | Scone Road | Barrington | Gloucester | LGOV |
| **Barrington Tops National Park** | | (not given) | Dungog | GAZ |
| **Barrington Tops National Park** | | Gloucester | Gloucester | LGOV |
| **Bonnie Doon** | Rawdon Vale Road | Rawdon Vale | Gloucester | LGOV |
| **Bonny Doon** | The Moppy Road | Rawdon Vale | Gloucester | GAZ |
| **Camels Hump Nature Reserve** | Nowendec Road | Gloucester | Gloucester | LGOV |
| **CBC Bank Building, Former** | 10 Queen Street | Gloucester | Gloucester | LGOV |
| **Coop Diary Co Factory Buildings** | Railway Street | Gloucester | Gloucester | LGOV |
| **Copeland No 2 General Cemetery** | Scone Road | Copeland | Gloucester | LGOV |
| **Copeland Tops Forests Preserve** | Scone Road | Copeland | Gloucester | LGOV |
| **Courthouse** | 19 Copeland Road | Gloucester | Gloucester | GAZ |
| **Courthouse** | 10 Church Street | Cloucester | Gloucester | LGOV |
| **Courthouse Group** | Church Street | Gloucester | Gloucester | GAZ |
| **Courthouse Group, Former** | Lake Street | Forster | Gloucester | GAZ |
| **Cyanide Treatment Works** | | Copeland | Gloucester | LGOV |
| **Disused Upper Avon Road Bridge** | Avon State Forest | Gloucester | Gloucester | LGOV |
| **Eastons House** | 16 Cowper Street | Gloucester | Gloucester | LGOV |
| **Fairview** | 1 Market Street | Gloucester | Gloucester | LGOV |
| **Faulkland** | | Faulkland | Gloucester | GAZ |
| **Faulkland** | Faulkland Road | Faulkland | Gloucester | LGOV |
| **Federation House** | Gardiners Lane | Gloucester | Gloucester | LGOV |
| **Folk Museum** | 12 Tyrell Street | Gloucester | Gloucester | GAZ |
| **Free Presbyterian Church** | | Barrington | Gloucester | LGOV |
| **Gloucester Cottage** | Bucketts Way | Gloucester | Gloucester | GAZ |
| **Gloucester Post Office** | 9 Queen Street | Gloucester | Gloucester | LGOV |
| **Gloucester Showground Precinct** | Baringtон Road | Gloucester | Gloucester | LGOV |
| **Gloucester Sports Ground Grandstand** | Barrington Road | Gloucester | Gloucester | LGOV |
| **Gloucesters Cottage** | 61 Denison Street | Gloucester | Gloucester | LGOV |
| **Hillcrest Hospital** | Barrington Street | Gloucester | Gloucester | LGOV |

| | | | | |
|---|---|---|---|---|
| **Hillcrest Hospital** | 16 Tyrell Street | Gloucester | Gloucester | LGOV |
| **John McKenzies Grave** | Gloucester Cemetery | Gloucester | Gloucester | LGOV |
| **Majestic Theatre** | 78 Church Street | Gloucester | Gloucester | LGOV |
| **Masonic Temple** | Church Street | Gloucester | Gloucester | LGOV |
| **McRae's Building** | 73 Church Street | Gloucester | Gloucester | LGOV |
| **Mountain Maid Glod Mine** | | Copeland | Gloucester | LGOV |
| **Mountain Maid Gold Mine** | | Copeland | Gloucester | GAZ |
| **Narraweena** | 10 Gregson Street | Gloucester | Gloucester | LGOV |
| **No.2 General Cemetery** | Copeland Road | Barrington | Gloucester | GAZ |
| **Original Gloucester Publlic School Building** | Hume Street | Gloucester | Gloucester | LGOV |
| **Original Public School Building** | | Rookhurst | Gloucester | LGOV |
| **Original School Residence** | Barrington East Road | Gloucester | Gloucester | LGOV |
| **Original Shire Council Chambers** | 12 Church Street | Cloucester | Gloucester | LGOV |
| **Payless Building** | 82 Church Street | Gloucester | Gloucester | LGOV |
| **PGK Survey Peg Mark** | Nowendoc Road | Gloucester | Gloucester | LGOV |
| **Pioneer Cemetery** | Barrington East Road | Barrington | Gloucester | GAZ |
| **Police Station** | 8 Church Street | Cloucester | Gloucester | LGOV |
| **Presbyterian Church** | | Rookhurst | Gloucester | LGOV |
| **Presbyterian Church Manse, Former** | 7 Barrington Street | Barrington | Gloucester | LGOV |
| **Rawdon Vale** | The Moppy Road | Rawdon Vale | Gloucester | LGOV |
| **Roma** | Barrington Street | Gloucester | Gloucester | LGOV |
| **School Of Arts** | 56 Church Street | Gloucester | Gloucester | LGOV |
| **Sellicks Chambers** | 42 Church Street | Gloucester | Gloucester | LGOV |
| **Sisters of St Joesphs Convent, Former** | Dension Street | Gloucester | Gloucester | LGOV |
| **Slab House** | 402 Barrington East Road | Gloucester | Gloucester | LGOV |
| **St Andrews Presbyterian Church and Hall** | Barrington Street | Gloucester | Gloucester | LGOV |
| **St. Clements Park Historic Site** | Church Street | Gloucester | Gloucester | LGOV |
| **St. Pauls Anglican Church and Rectory** | Hume Street | Gloucester | Gloucester | LGOV |
| **Stobo** | The Moppy Road | Rawdon Vale | Gloucester | LGOV |
| **Thunderbolts Cave** | Bucketts Road | Gloucester | Gloucester | LGOV |

| | | | | |
|---|---|---|---|---|
| **Timbers Workers House, Former** | Barrington Street | Gloucester | Gloucester | LGOV |
| **War Memorial Clocktower** | Bent Street | Gloucester | Gloucester | LGOV |
| **Water Tower** | Tyrell Street | Gloucester | Gloucester | LGOV |
| **Westpac Bank** | 47 Church Street | Gloucester | Gloucester | LGOV |
| **Woko National Park** | Curricabark Road | Gloucester | Gloucester | LGOV |

There were **75** records in this section matching your search criteria.

There was a total of **76** records matching your search criteria.

**Key:**
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

**Note:** The Heritage Branch seeks to keep the State Heritage Inventory (SHI) up to date, however the latest listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be included. Always check with the relevant Local Council or Shire for the most recent listings.

Click on the BACK button of your browser to return to the search.

# Statutory Listed Items

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## Section 1. Items listed under the NSW Heritage Act.

Click on an item name to view the full details.
The search results can be re-sorted by clicking on the **(sort)** option at the top of each column.

| Item Name (sort) | Address (sort) | Suburb (sort) | LGA (sort) | Listed Under Heritage Act |
|---|---|---|---|---|
| Gundayne House Group | The Bucketts Way | Booral | Great Lakes | Yes |
| Monkerai Bridge over Karuah River | Main Road 101 | Monkerai | Great Lakes | Yes |
| St. John the Evangelist Anglican Church Group | Main Street | Stroud | Great Lakes | Yes |
| Tahlee Bible College | Tahlee Road | Carrington | Great Lakes | Yes |

There were **4** records in this section matching your search criteria.

## Section 2. Items listed by Local Government and State agencies.

| Item Name (sort) | Address (sort) | Suburb (sort) | LGA (sort) | Information Source (sort) |
|---|---|---|---|---|
| AA Co Cottages (former) | Berkeley Street | Stroud | Great Lakes | LGOV |
| Alderley House | The Bucketts Way Parish | Booral | Great Lakes | LGOV |
| Allworth Wharf (remains) | Allworth River | Allworth | Great Lakes | LGOV |
| Aluminium Mine (former) | Bulahdelah Mountain | Bulahdelah | Great Lakes | LGOV |
| Bank of New South Wales (former) | 44 Cowper Street | Stroud | Great Lakes | LGOV |

| | | | | |
|---|---|---|---|---|
| **Baptist Church** | 70 Cowper Street | Stroud | Great Lakes | LGOV |
| **Booral House** | Isaccs Lane | Booral | Great Lakes | LGOV |
| **Booral Wharf** | Karuah River, Booral (about 1 mile south) | Booral | Great Lakes | LGOV |
| **Brick cottage (2 roomed)** | Cock Renoyo Point | Carrington | Great Lakes | LGOV |
| **Carrington Boat Harbour and Lime Kiln** | Cock Renoyo Point | Carrington | Great Lakes | LGOV |
| **Carrington Cemetery** | Tahlee Road | Carrington | Great Lakes | LGOV |
| **Central Hotel** | 9 Memorial Avenue | Stroud | Great Lakes | LGOV |
| **Council Chambers (former)** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Court House Group (former)** | Lake Street | Forster | Great Lakes | LGOV |
| **Courthouse** | 53 Marine Drive | Tea Gardens | Great Lakes | LGOV |
| **Courthouse (former)** | Crawford Street | Bulahdelah | Great Lakes | LGOV |
| **Courthouse (former)** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Darawank Public School (former)** | Manns Road | Darawank | Great Lakes | LGOV |
| **ES & A Bank and Dwelling (former)** | Nabiac Street | Nabiac | Great Lakes | LGOV |
| **Failford: house** | Failford Road | Failford | Great Lakes | LGOV |
| **Gables, The** | Lowes Lane | Booral | Great Lakes | LGOV |
| **General Cemetery** | Markwell Road | Bulahdelah | Great Lakes | LGOV |
| **General Cemetery** | St Albans Place | Forster | Great Lakes | LGOV |
| **General Cemetery** | 28 Yalinbah Street | Tea Gardens | Great Lakes | LGOV |
| **Gundayne House Group, Residence, Outhouse, Schoolhouse** | The Buckets Way | Booral | Great Lakes | LGOV |
| **Hancocks Store** | 7-9 Nabiac Street | Nabiac | Great Lakes | LGOV |
| **Hospital (former)** | 37 Nabiac Street | Nabiac | Great Lakes | LGOV |
| **House** | Bridge Street | Stroud | Great Lakes | LGOV |
| **House** | Mill Creek Road | Stroud | Great | LGOV |

| | | | | |
|---|---|---|---|---|
| | | | Lakes | |
| **House opposite park** | 77 Clarkson Street | Nabiac | Great Lakes | LGOV |
| **Kauri & Co's Railway** | | Bulahdelah | Great Lakes | LGOV |
| **Lighthouse Group** | Sugarloaf Point | Seal Rocks | Great Lakes | LGOV |
| **Methodist Church** | Stroud Road | Stroud | Great Lakes | LGOV |
| **Monkerai Bridge Over Karuah River** | Weismantels-dingadee Rd | Monkerai | Great Lakes | SGOV |
| **Monkerai Hall** | Moores Road | Monkerai | Great Lakes | LGOV |
| **Morris Property Graves** | Curreeki Creek Road | Coolongolook | Great Lakes | LGOV |
| **Nerani Head Cemetery** | | Nerani Head | Great Lakes | LGOV |
| **Old Bungwahl Cemetery** | The Lakes Way | Bungwahl | Great Lakes | LGOV |
| **Post Office** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Public school and residence** | Erin Street | Stroud | Great Lakes | LGOV |
| **School of Arts** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Showground** | Nabiac Street | Nabiac | Great Lakes | LGOV |
| **Single storey residences (3)** | Broadway Street | Stroud | Great Lakes | LGOV |
| **St Andrew's Church (former)** | Church Street | Carrington | Great Lakes | LGOV |
| **St Barnabas Church and Cemetery** | The Bucketts Way | Booral | Great Lakes | LGOV |
| **St. Columbine's Church** | Broadway Street | Stroud | Great Lakes | LGOV |
| **St. James Church** | 25 Erin Street | Stroud | Great Lakes | LGOV |
| **St. John the Evangelist Church Group including Quambi House** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Stroud Ambulance Station** | 10 Cowper Street | Stroud | Great Lakes | SGOV |
| **Stroud House** | Cowper Street | Stroud | Great Lakes | LGOV |
| **Stroud Road, Karuah River Underbridge** | 266.155km North Coast Railway | Stroud Road | Great Lakes | SGOV |
| **Tahlee House** | Tahlee Road | Carrington | Great Lakes | LGOV |

| | | | | |
|---|---|---|---|---|
| **Thornleigh: two storey colonial home** | Berkeley Street | Stroud | Great Lakes | LGOV |
| **Timber Church** | Wharf Street | Tuncurry | Great Lakes | LGOV |
| **Timber Cottage** | Bennett Street | Hawks Nest | Great Lakes | LGOV |
| **Tokalau: single dwelling** | 2 Manning Street | Tuncurry | Great Lakes | LGOV |
| **Tramline Trestle Bridge** | Horses Creek | Bulahdelah | Great Lakes | LGOV |
| **Tudor House Restaurant and Bar** | West Street | Forster | Great Lakes | LGOV |
| **Tuncurry House** | South Street | Tuncurry | Great Lakes | LGOV |
| **Underground grain silos and cannons** | Silo Hill | Stroud | Great Lakes | LGOV |
| **Uniting Church and Hall** | Church Street | Stroud | Great Lakes | LGOV |
| **Washpool** | 7.5 km south Karuah River | Stroud | Great Lakes | LGOV |
| **Weismantels Inn (former)** | The Bucketts Way | Monkerai | Great Lakes | LGOV |

There were **63** records in this section matching your search criteria.

There was a total of **67** records matching your search criteria.

**Key:**
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

**Note:** The Heritage Branch seeks to keep the State Heritage Inventory (SHI) up to date, however the latest listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be included. Always check with the relevant Local Council or Shire for the most recent listings.

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

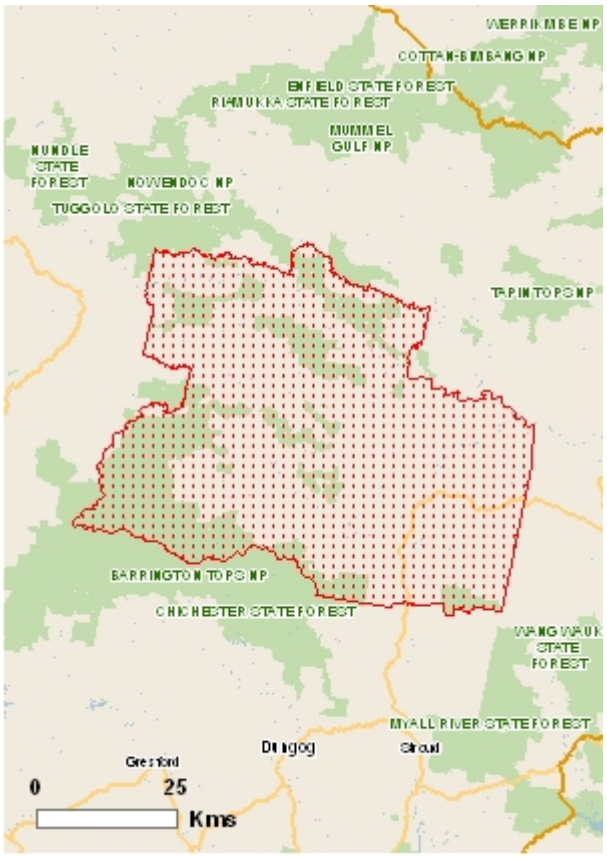
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

## LGA GLOUCESTER, NSW

## Report created: 14/07/11 11:07:10






This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

| | |
|---|---|
| World Heritage Properties: | 1 |
| National Heritage Places: | 2 |
| Wetlands of International Significance (Ramsar Wetlands): | 2 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Areas: | None |
| Threatened Ecological Communitites: | 1 |
| Threatened Species: | 24 |
| Migratory Species: | 15 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

| | |
|---|---|
| Commonwealth Lands: | 4 |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 13 |
| Whales and Other Cetaceans: | None |

| | |
|---|---|
| Critical Habitats: | None |
| Commonwealth Reserves: | None |

## Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| Place on the RNE: | 9 |
| State and Territory Reserves: | 16 |
| Regional Forest Agreements: | 1 |
| Invasive Species: | 17 |
| Nationally Important Wetlands: | 1 |

# Details

## Matters of National Environmental Significance

### World Heritage Properties [ Resource Information ]

| Name | Status |
|---|---|
| Gondwana Rainforests of Australia NSW | Declared property |

### National Heritage Places [ Resource Information ]

| Name | Status |
|---|---|
| **Natural** | |
| Gondwana Rainforests of Australia NSW | Listed place |
| **Historic** | |
| The Stroud Gloucester Valley NSW | Nominated place |

### Wetlands of International Significance (RAMSAR Sites) [ Resource Information ]

| Name | Proximity |
|---|---|
| Hunter estuary wetlands | Upstream from Ramsar site |
| Myall lakes | Upstream from Ramsar site |

### Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

| Name | Status | Type of Presence |
|---|---|---|
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | Community likely to occur within area |

### Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| **BIRDS** | | |
| Anthochaera phrygia | | |

| | | |
|---|---|---|
| Regent Honeyeater [82338] | Endangered | Species or species habitat may occur within area |
| Lathamus discolor | | |
| Swift Parrot [744] | Endangered | Species or species habitat likely to occur within area |
| Rostratula australis | | |
| Australian Painted Snipe [77037] | Vulnerable | Species or species habitat may occur within area |
| **FROGS** | | |
| Litoria aurea | | |
| Green and Golden Bell Frog [1870] | Vulnerable | Species or species habitat may occur within area |
| Litoria booroolongensis | | |
| Booroolong Frog [1844] | Endangered | Species or species habitat may occur within area |
| Mixophyes balbus | | |
| Stuttering Frog, Southern Barred Frog (in Victoria) [1942] | Vulnerable | Species or species habitat likely to occur within area |
| Mixophyes iteratus | | |
| Giant Barred Frog, Southern Barred Frog [1944] | Endangered | Species or species habitat likely to occur within area |
| **MAMMALS** | | |
| Chalinolobus dwyeri | | |
| Large-eared Pied Bat, Large Pied Bat [183] | Vulnerable | Species or species habitat may occur within area |
| Dasyurus maculatus maculatus (SE mainland population) | | |
| Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat may occur within area |
| Petrogale penicillata | | |
| Brush-tailed Rock-wallaby [225] | Vulnerable | Species or species habitat may occur within area |
| Potorous tridactylus tridactylus | | |
| Long-nosed Potoroo (SE mainland) [66645] | Vulnerable | Species or species habitat may occur within area |
| Pseudomys novaehollandiae | | |
| New Holland Mouse [96] | Vulnerable | Species or species habitat known to occur within area |
| Pseudomys oralis | | |
| Hastings River Mouse [98] | Endangered | Species or species habitat likely to occur within area |
| Pteropus poliocephalus | | |
| Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| **PLANTS** | | |
| Allocasuarina defungens | | |
| Dwarf Heath Casuarina [21924] | Endangered | Species or species habitat likely to occur within area |
| Callistemon pungens | | |
| [55581] | Vulnerable | Species or species habitat likely to occur within area |
| Cryptostylis hunteriana | | |
| Leafless Tongue-orchid [19533] | Vulnerable | Species or species habitat may occur within area |
| Cynanchum elegans | | |
| White-flowered Wax Plant [12533] | Endangered | Species or species habitat likely to occur within area |

| | | |
|---|---|---|
| Diuris venosa<br>Veined Doubletail, Goat Orchid, Veined Donkey-orchid [6425] | Vulnerable | Species or species habitat likely to occur within area |
| Eucalyptus glaucina<br>Slaty Red Gum [5670] | Vulnerable | Species or species habitat likely to occur within area |
| Tasmannia glaucifolia<br>Fragrant Pepperbush [21975] | Vulnerable | Species or species habitat likely to occur within area |
| Tasmannia purpurascens<br>Broad-leaved Pepperbush [9022] | Vulnerable | Species or species habitat likely to occur within area |
| Thesium australe<br>Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat likely to occur within area |
| Tylophora woollsii<br>[20503] | Endangered | Species or species habitat likely to occur within area |

**Migratory Species** **[ Resource Information ]**

| Name | Status | Type of Presence |
|---|---|---|
| Migratory Marine Birds | | |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat may occur within area |
| Ardea alba<br>Great Egret, White Egret [59541] | | Species or species habitat may occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Migratory Terrestrial Species | | |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Breeding may occur within area |
| Monarcha trivirgatus<br>Spectacled Monarch [610] | | Breeding likely to occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Breeding likely to occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Breeding may occur within area |
| Xanthomyza phrygia<br>Regent Honeyeater [430] | | Species or species habitat may occur within area |
| Migratory Wetlands Species | | |
| Ardea alba<br>Great Egret, White Egret | | Species or species habitat may occur within area |

[59541]
Ardea ibis
Cattle Egret [59542] Species or species habitat may occur within area
Gallinago hardwickii
Latham's Snipe, Japanese Snipe [863] Species or species habitat may occur within area
Rostratula benghalensis s. lat.
Painted Snipe [889] Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land - Australian Postal Commission
Commonwealth Land - Telstra Corporation Limited
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia

### Listed Marine Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat may occur within area |
| Ardea alba | | |
| Great Egret, White Egret [59541] | | Species or species habitat may occur within area |
| Ardea ibis | | |
| Cattle Egret [59542] | | Species or species habitat may occur within area |
| Gallinago hardwickii | | |
| Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster | | |
| White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Hirundapus caudacutus | | |
| White-throated Needletail [682] | | Species or species habitat may occur within area |
| Lathamus discolor | | |
| Swift Parrot [744] | Endangered | Species or species habitat likely to occur within area |
| Merops ornatus | | |
| Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis | | |
| Black-faced Monarch [609] | | Breeding may occur within area |
| Monarcha trivirgatus | | |
| Spectacled Monarch [610] | | Breeding likely to occur within area |
| Myiagra cyanoleuca | | |
| Satin Flycatcher [612] | | Breeding likely to occur within area |
| Rhipidura rufifrons | | |
| Rufous Fantail [592] | | Breeding may occur within area |
| Rostratula benghalensis s. lat. | | |

| | |
|---|---|
| Painted Snipe [889] | Species or species habitat may occur within area |

## Extra Information

### Places on the RNE [ Resource Information ]

Note that not all Indigenous sites may be listed.

| Name | Status |
|---|---|
| **Natural** | |
| Barrington Tops Wilderness Area NSW | Indicative Place |
| Barrington Tops National Park (1978 boundary) NSW | Registered |
| Camels Hump Nature Reserve NSW | Registered |
| Woko National Park (1991 boundary) NSW | Registered |
| **Historic** | |
| Gloucester Showground NSW | Indicative Place |
| Gloucester Soldiers Memorial NSW | Indicative Place |
| Vale of Gloucester NSW | Indicative Place |
| Folk Museum NSW | Registered |
| Gloucester Cottage NSW | Registered |

### State and Territory Reserves [ Resource Information ]

Curracabundi, NSW
Camels Hump, NSW
Barrington Tops, NSW
Copeland Tops, NSW
Berrico, NSW
Woko, NSW
Bretti, NSW
Monkeycot, NSW
Barrington Tops, NSW
Nowendoc, NSW
Curracabundi, NSW
Barakee, NSW
The Glen, NSW
Watchimbark, NSW
Mernot, NSW
Coneac, NSW

### Regional Forest Agreements [ Resource Information ]

Note that all areas with completed RFAs have been included.

North East NSW RFA, New South Wales

### Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| **Frogs** | | |
| Bufo marinus | | |
| Cane Toad [1772] | | Species or species habitat likely to occur within area |
| Bubalus bubalis | | |

| | |
|---|---|
| Water Buffalo, Swamp Buffalo [1] | Species or species habitat may occur within area |
| Capra hircus | |
| Goat [2] | Species or species habitat may occur within area |
| Felis catus | |
| Cat, House Cat, Domestic Cat [19] | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus | |
| Rabbit, European Rabbit [128] | Species or species habitat likely to occur within area |
| Sus scrofa | |
| Pig [6] | Species or species habitat may occur within area |
| Vulpes vulpes | |
| Red Fox, Fox [18] | Species or species habitat likely to occur within area |
| Cabomba caroliniana | |
| Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] | Species or species habitat may occur within area |
| Chrysanthemoides monilifera | |
| Bitou Bush, Boneseed [18983] | Species or species habitat likely to occur within area |
| Genista sp. X Genista monspessulana | |
| Broom [67538] | Species or species habitat may occur within area |
| Lantana camara | |
| Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] | Species or species habitat likely to occur within area |
| Lycium ferocissimum | |
| African Boxthorn, Boxthorn [19235] | Species or species habitat may occur within area |
| Nassella trichotoma | |
| Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | Species or species habitat may occur within area |
| Pinus radiata | |
| Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | Species or species habitat may occur within area |
| Rubus fruticosus aggregate | |
| Blackberry, European Blackberry [68406] | Species or species habitat likely to occur within area |
| Salvinia molesta | |
| Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] | Species or species habitat likely to occur within area |
| Ulex europaeus | |
| Gorse, Furze [7693] | Species or species habitat may occur within area |

Barrington Top Swamps, NSW

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:
- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:
- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:
- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria

-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.



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Australian Government
Department of Sustainability, Environment, Water, Population and Communities

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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## LGA GREAT LAKES, NSW

## Report created: 14/07/11 11:07:45




This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

| | |
|---|---|
| World Heritage Properties: | 1 |
| National Heritage Places: | 2 |
| Wetlands of International Significance (Ramsar Wetlands): | 2 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Areas: | None |
| Threatened Ecological Communitites: | 2 |
| Threatened Species: | 56 |
| Migratory Species: | 65 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

| | |
|---|---|
| Commonwealth Lands: | 5 |
| Commonwealth Heritage Places: | 1 |
| Listed Marine Species: | 86 |
| Whales and Other Cetaceans: | 13 |

| | |
|---|---|
| Critical Habitats: | None |
| Commonwealth Reserves: | None |

## Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| Place on the RNE: | 42 |
| State and Territory Reserves: | 28 |
| Regional Forest Agreements: | 1 |
| Invasive Species: | 17 |
| Nationally Important Wetlands: | 3 |

# Details

## Matters of National Environmental Significance

### World Heritage Properties [ Resource Information ]

| Name | Status |
|---|---|
| Gondwana Rainforests of Australia NSW | Declared property |

### National Heritage Places [ Resource Information ]

| Name | Status |
|---|---|
| **Natural** | |
| Gondwana Rainforests of Australia NSW | Listed place |
| **Historic** | |
| The Stroud Gloucester Valley NSW | Nominated place |

### Wetlands of International Significance (RAMSAR Sites) [ Resource Information ]

| Name | Proximity |
|---|---|
| Hunter estuary wetlands | Upstream from Ramsar site |
| Myall lakes | Within Ramsar site |

### Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

| Name | Status | Type of Presence |
|---|---|---|
| Littoral Rainforest and Coastal Vine Thickets of Eastern Australia | Critically Endangered | Community likely to occur within area |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | Community may occur within area |

### Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| **BIRDS** | | |
| Anthochaera phrygia | | |
| Regent Honeyeater [82338] | Endangered | Species or species habitat may occur within area |
| Diomedea exulans amsterdamensis | | |
| Amsterdam Albatross [82330] | Endangered | Species or species habitat may occur within area |
| Diomedea exulans antipodensis | | |
| Antipodean Albatross [82269] | Vulnerable | Species or species habitat may occur within area |
| Diomedea exulans exulans | | |
| Tristan Albatross [82337] | Endangered | Foraging, feeding or related behaviour may occur within area |
| Diomedea exulans gibsoni | | |
| Gibson's Albatross [82271] | Vulnerable | Species or species habitat may occur within area |
| Diomedea exulans (sensu lato) | | |
| Wandering Albatross [1073] | Vulnerable | Species or species habitat may occur within area |
| Lathamus discolor | | |
| Swift Parrot [744] | Endangered | Species or species habitat likely to occur within area |
| Macronectes giganteus | | |
| Southern Giant-Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli | | |
| Northern Giant-Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Pterodroma leucoptera leucoptera | | |
| Gould's Petrel [26033] | Endangered | Species or species habitat may occur within area |
| Pterodroma neglecta neglecta | | |
| Kermadec Petrel (western) [64450] | Vulnerable | Species or species habitat may occur within area |
| Rostratula australis | | |
| Australian Painted Snipe [77037] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche bulleri | | |
| Buller's Albatross [64460] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta cauta | | |
| Shy Albatross, Tasmanian Shy Albatross [82345] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta salvini | | |
| Salvin's Albatross [82343] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta steadi | | |
| White-capped Albatross [82344] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche melanophris | | |
| Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche melanophris impavida | | |
| Campbell Albatross [82449] | Vulnerable | Species or species habitat may occur within area |
| **FROGS** | | |
| Litoria aurea | | |
| Green and Golden Bell Frog [1870] | Vulnerable | Species or species habitat likely to occur within area |
| Litoria booroolongensis | | |
| Booroolong Frog [1844] | Endangered | Species or species habitat may occur within area |
| Mixophyes balbus | | |
| Stuttering Frog, Southern Barred | Vulnerable | Species or species habitat likely to occur within area |

| | | |
|---|---|---|
| Frog (in Victoria) [1942] | | |
| Mixophyes iteratus | | |
| Giant Barred Frog, Southern Barred Frog [1944] | Endangered | Species or species habitat likely to occur within area |
| **MAMMALS** | | |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat may occur within area |
| Chalinolobus dwyeri | | |
| Large-eared Pied Bat, Large Pied Bat [183] | Vulnerable | Species or species habitat may occur within area |
| Dasyurus maculatus maculatus (SE mainland population) | | |
| Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat may occur within area |
| Eubalaena australis | | |
| Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area |
| Megaptera novaeangliae | | |
| Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Petrogale penicillata | | |
| Brush-tailed Rock-wallaby [225] | Vulnerable | Species or species habitat may occur within area |
| Potorous tridactylus tridactylus | | |
| Long-nosed Potoroo (SE mainland) [66645] | Vulnerable | Species or species habitat may occur within area |
| Pseudomys novaehollandiae | | |
| New Holland Mouse [96] | Vulnerable | Species or species habitat known to occur within area |
| Pseudomys oralis | | |
| Hastings River Mouse [98] | Endangered | Species or species habitat likely to occur within area |
| Pteropus poliocephalus | | |
| Grey-headed Flying-fox [186] | Vulnerable | Roosting known to occur within area |
| **PLANTS** | | |
| Allocasuarina defungens | | |
| Dwarf Heath Casuarina [21924] | Endangered | Species or species habitat known to occur within area |
| Allocasuarina simulans | | |
| [21935] | Vulnerable | Species or species habitat likely to occur within area |
| Angophora inopina | | |
| [64832] | Vulnerable | Species or species habitat likely to occur within area |
| Asperula asthenes | | |
| Trailing Woodruff [14004] | Vulnerable | Species or species habitat likely to occur within area |
| Cryptostylis hunteriana | | |
| Leafless Tongue-orchid [19533] | Vulnerable | Species or species habitat may occur within area |
| Cynanchum elegans | | |
| White-flowered Wax Plant [12533] | Endangered | Species or species habitat likely to occur within area |
| Diuris praecox | | |

| | | |
|---|---|---|
| Newcastle Doubletail [55086] | Vulnerable | Species or species habitat likely to occur within area |
| Eucalyptus parramattensis subsp. decadens | | |
| Earp's Gum, Earp's Dirty Gum [56148] | Vulnerable | Species or species habitat likely to occur within area |
| Melaleuca biconvexa | | |
| Biconvex Paperbark [5583] | Vulnerable | Species or species habitat known to occur within area |
| Rhizanthella slateri | | |
| Eastern Underground Orchid [11768] | Endangered | Species or species habitat known to occur within area |
| Syzygium paniculatum | | |
| Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307] | Vulnerable | Species or species habitat likely to occur within area |
| Tetratheca juncea | | |
| Black-eyed Susan [21407] | Vulnerable | Species or species habitat likely to occur within area |
| Thesium australe | | |
| Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat likely to occur within area |
| Tylophora woollsii | | |
| [20503] | Endangered | Species or species habitat likely to occur within area |
| **REPTILES** | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Hoplocephalus bungaroides | | |
| Broad-headed Snake [1182] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| **SHARKS** | | |
| Carcharias taurus (east coast population) | | |
| Grey Nurse Shark (east coast population) [68751] | Critically Endangered | Congregation or aggregation known to occur within area |
| Carcharodon carcharias | | |
| Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |

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|---|---|---|
| Pristis zijsron | | |
| Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat may occur within area |
| Rhincodon typus | | |
| Whale Shark [66680] | Vulnerable | Species or species habitat may occur within area |

## Migratory Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Migratory Marine Birds | | |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat may occur within area |
| Ardea alba | | |
| Great Egret, White Egret [59541] | | Species or species habitat may occur within area |
| Ardea ibis | | |
| Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calonectris leucomelas | | |
| Streaked Shearwater [1077] | | Species or species habitat may occur within area |
| Diomedea amsterdamensis | | |
| Amsterdam Albatross [64405] | | Species or species habitat may occur within area |
| Diomedea antipodensis | | |
| Antipodean Albatross [64458] | | Species or species habitat may occur within area |
| Diomedea dabbenena | | |
| Tristan Albatross [66471] | | Foraging, feeding or related behaviour may occur within area |
| Diomedea exulans (sensu lato) | | |
| Wandering Albatross [1073] | Vulnerable | Species or species habitat may occur within area |
| Diomedea gibsoni | | |
| Gibson's Albatross [64466] | | Species or species habitat may occur within area |
| Macronectes giganteus | | |
| Southern Giant-Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli | | |
| Northern Giant-Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Pterodroma leucoptera leucoptera | | |
| Gould's Petrel [26033] | Endangered | Species or species habitat may occur within area |
| Puffinus leucomelas | | |
| Streaked Shearwater [66541] | | Species or species habitat may occur within area |
| Sterna albifrons | | |
| Little Tern [813] | | Breeding likely to occur within area |
| Thalassarche bulleri | | |
| Buller's Albatross [64460] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta (sensu stricto) | | |
| Shy Albatross, Tasmanian Shy Albatross [64697] | | Species or species habitat may occur within area |
| Thalassarche impavida | | |
| Campbell Albatross [64459] | | Species or species habitat may occur within area |
| Thalassarche melanophris | | |
| Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche salvini | | |
| Salvin's Albatross [64463] | | Species or species habitat may occur within area |
| Thalassarche steadi | | |

| | | |
|---|---|---|
| White-capped Albatross [64462] | | Species or species habitat may occur within area |
| Migratory Marine Species | | |
| Balaenoptera edeni | | |
| Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat may occur within area |
| Caperea marginata | | |
| Pygmy Right Whale [39] | | Species or species habitat may occur within area |
| Carcharodon carcharias | | |
| Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Eubalaena australis | | |
| Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area |
| Lagenorhynchus obscurus | | |
| Dusky Dolphin [43] | | Species or species habitat may occur within area |
| Megaptera novaeangliae | | |
| Humpback Whale [38] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Orcinus orca | | |
| Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Rhincodon typus | | |
| Whale Shark [66680] | Vulnerable | Species or species habitat may occur within area |
| Migratory Terrestrial Species | | |
| Haliaeetus leucogaster | | |
| White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Hirundapus caudacutus | | |
| White-throated Needletail [682] | | Species or species habitat may occur within area |
| Merops ornatus | | |
| Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis | | |
| Black-faced Monarch [609] | | Breeding may occur within area |
| Monarcha trivirgatus | | |
| Spectacled Monarch [610] | | Breeding likely to occur within area |
| Myiagra cyanoleuca | | |
| Satin Flycatcher [612] | | Breeding likely to occur within area |
| Rhipidura rufifrons | | |

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|---|---|
| Rufous Fantail [592] | Breeding may occur within area |
| Xanthomyza phrygia | |
| Regent Honeyeater [430] | Species or species habitat may occur within area |
| Migratory Wetlands Species | |
| Actitis hypoleucos | |
| Common Sandpiper [59309] | Roosting known to occur within area |
| Ardea alba | |
| Great Egret, White Egret [59541] | Species or species habitat may occur within area |
| Ardea ibis | |
| Cattle Egret [59542] | Species or species habitat may occur within area |
| Arenaria interpres | |
| Ruddy Turnstone [872] | Roosting known to occur within area |
| Calidris acuminata | |
| Sharp-tailed Sandpiper [874] | Roosting known to occur within area |
| Calidris canutus | |
| Red Knot, Knot [855] | Roosting known to occur within area |
| Calidris ferruginea | |
| Curlew Sandpiper [856] | Roosting known to occur within area |
| Calidris ruficollis | |
| Red-necked Stint [860] | Roosting known to occur within area |
| Calidris tenuirostris | |
| Great Knot [862] | Roosting known to occur within area |
| Charadrius bicinctus | |
| Double-banded Plover [895] | Roosting known to occur within area |
| Charadrius mongolus | |
| Lesser Sand Plover, Mongolian Plover [879] | Roosting known to occur within area |
| Gallinago hardwickii | |
| Latham's Snipe, Japanese Snipe [863] | Roosting may occur within area |
| Heteroscelus brevipes | |
| Grey-tailed Tattler [59311] | Roosting known to occur within area |
| Limosa lapponica | |
| Bar-tailed Godwit [844] | Roosting known to occur within area |
| Limosa limosa | |
| Black-tailed Godwit [845] | Roosting known to occur within area |
| Numenius madagascariensis | |
| Eastern Curlew [847] | Roosting known to occur within area |
| Numenius minutus | |
| Little Curlew, Little Whimbrel [848] | Roosting likely to occur within area |
| Numenius phaeopus | |
| Whimbrel [849] | Roosting known to occur within area |
| Pluvialis fulva | |
| Pacific Golden Plover [25545] | Roosting known to occur within area |
| Pluvialis squatarola | |
| Grey Plover [865] | Roosting known to occur within area |
| Rostratula benghalensis s. lat. | |
| Painted Snipe [889] | Species or species habitat may occur within area |
| Tringa stagnatilis | |
| Marsh Sandpiper, Little | Roosting known to occur within area |

Greenshank [833]
Xenus cinereus
Terek Sandpiper [59300] Roosting known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land - Australian Postal Commission
Commonwealth Land - Telstra Corporation Limited
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Royal Australian Navy Central Canteens Board
Commonwealth Land - Australian Telecommunications Commission

### Commonwealth Heritage Places [ Resource Information ]

| Name | Status |
|---|---|
| Historic | |
| Sugarloaf Point Lighthouse NSW | Listed place |

### Listed Marine Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Roosting known to occur within area |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat may occur within area |
| Ardea alba | | |
| Great Egret, White Egret [59541] | | Species or species habitat may occur within area |
| Ardea ibis | | |
| Cattle Egret [59542] | | Species or species habitat may occur within area |
| Arenaria interpres | | |
| Ruddy Turnstone [872] | | Roosting known to occur within area |
| Calidris acuminata | | |
| Sharp-tailed Sandpiper [874] | | Roosting known to occur within area |
| Calidris canutus | | |
| Red Knot, Knot [855] | | Roosting known to occur within area |
| Calidris ferruginea | | |
| Curlew Sandpiper [856] | | Roosting known to occur within area |
| Calidris melanotos | | |
| Pectoral Sandpiper [858] | | Roosting known to occur within area |
| Calidris ruficollis | | |
| Red-necked Stint [860] | | Roosting known to occur within area |
| Calidris tenuirostris | | |
| Great Knot [862] | | Roosting known to occur within area |
| Calonectris leucomelas | | |
| Streaked Shearwater [1077] | | Species or species habitat may occur within area |
| Catharacta skua | | |
| Great Skua [59472] | | Species or species habitat may occur within area |

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|---|---|---|
| Charadrius bicinctus<br>Double-banded Plover [895] | | Roosting known to occur within area |
| Charadrius mongolus<br>Lesser Sand Plover, Mongolian Plover [879] | | Roosting known to occur within area |
| Charadrius ruficapillus<br>Red-capped Plover [881] | | Roosting known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | | Species or species habitat may occur within area |
| Diomedea antipodensis<br>Antipodean Albatross [64458] | | Species or species habitat may occur within area |
| Diomedea dabbenena<br>Tristan Albatross [66471] | | Foraging, feeding or related behaviour may occur within area |
| Diomedea exulans (sensu lato)<br>Wandering Albatross [1073] | Vulnerable | Species or species habitat may occur within area |
| Diomedea gibsoni<br>Gibson's Albatross [64466] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Roosting may occur within area |
| Gallinago megala<br>Swinhoe's Snipe [864] | | Roosting likely to occur within area |
| Gallinago stenura<br>Pin-tailed Snipe [841] | | Roosting likely to occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Heteroscelus brevipes<br>Grey-tailed Tattler [59311] | | Roosting known to occur within area |
| Himantopus himantopus<br>Black-winged Stilt [870] | | Roosting known to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | | Species or species habitat may occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Endangered | Species or species habitat likely to occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Roosting known to occur within area |
| Limosa limosa<br>Black-tailed Godwit [845] | | Roosting known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant-Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Breeding may occur within area |
| Monarcha trivirgatus<br>Spectacled Monarch [610] | | Breeding likely to occur within area |
| Myiagra cyanoleuca | | |

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|---|---|---|
| Satin Flycatcher [612] | | Breeding likely to occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew [847] | | Roosting known to occur within area |
| Numenius minutus | | |
| Little Curlew, Little Whimbrel [848] | | Roosting likely to occur within area |
| Numenius phaeopus | | |
| Whimbrel [849] | | Roosting known to occur within area |
| Pluvialis fulva | | |
| Pacific Golden Plover [25545] | | Roosting known to occur within area |
| Pluvialis squatarola | | |
| Grey Plover [865] | | Roosting known to occur within area |
| Recurvirostra novaehollandiae | | |
| Red-necked Avocet [871] | | Roosting known to occur within area |
| Rhipidura rufifrons | | |
| Rufous Fantail [592] | | Breeding may occur within area |
| Rostratula benghalensis s. lat. | | |
| Painted Snipe [889] | | Species or species habitat may occur within area |
| Sterna albifrons | | |
| Little Tern [813] | | Breeding likely to occur within area |
| Thalassarche bulleri | | |
| Buller's Albatross [64460] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta (sensu stricto) | | |
| Shy Albatross, Tasmanian Shy Albatross [64697] | | Species or species habitat may occur within area |
| Thalassarche impavida | | |
| Campbell Albatross [64459] | | Species or species habitat may occur within area |
| Thalassarche melanophris | | |
| Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche salvini | | |
| Salvin's Albatross [64463] | | Species or species habitat may occur within area |
| Thalassarche steadi | | |
| White-capped Albatross [64462] | | Species or species habitat may occur within area |
| Tringa stagnatilis | | |
| Marsh Sandpiper, Little Greenshank [833] | | Roosting known to occur within area |
| Xenus cinereus | | |
| Terek Sandpiper [59300] | | Roosting known to occur within area |
| Fish | | |
| Acentronura tentaculata | | |
| Shortpouch Pygmy Pipehorse [66187] | | Species or species habitat may occur within area |
| Festucalex cinctus | | |
| Girdled Pipefish [66214] | | Species or species habitat may occur within area |
| Filicampus tigris | | |
| Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Heraldia nocturna | | |
| Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227] | | Species or species habitat may occur within area |
| Hippichthys heptagonus | | |
| Madura Pipefish, Reticulated | | Species or species habitat may occur within area |

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|---|---|
| Freshwater Pipefish [66229] | |
| Hippichthys penicillus | |
| Beady Pipefish, Steep-nosed Pipefish [66231] | Species or species habitat may occur within area |
| Hippocampus abdominalis | |
| Bigbelly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233] | Species or species habitat may occur within area |
| Hippocampus whitei | |
| White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240] | Species or species habitat may occur within area |
| Histiogamphelus briggsii | |
| Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242] | Species or species habitat may occur within area |
| Lissocampus runa | |
| Javelin Pipefish [66251] | Species or species habitat may occur within area |
| Maroubra perserrata | |
| Sawtooth Pipefish [66252] | Species or species habitat may occur within area |
| Notiocampus ruber | |
| Red Pipefish [66265] | Species or species habitat may occur within area |
| Phyllopteryx taeniolatus | |
| Common Seadragon, Weedy Seadragon [66268] | Species or species habitat may occur within area |
| Solegnathus dunckeri | |
| Duncker's Pipehorse [66271] | Species or species habitat may occur within area |
| Solegnathus spinosissimus | |
| Spiny Pipehorse, Australian Spiny Pipehorse [66275] | Species or species habitat may occur within area |
| Solenostomus cyanopterus | |
| Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | Species or species habitat may occur within area |
| Solenostomus paegnius | |
| Rough-snout Ghost Pipefish [68425] | Species or species habitat may occur within area |
| Solenostomus paradoxus | |
| Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184] | Species or species habitat may occur within area |
| Stigmatopora argus | |
| Spotted Pipefish, Gulf Pipefish [66276] | Species or species habitat may occur within area |
| Stigmatopora nigra | |
| Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277] | Species or species habitat may occur within area |
| Syngnathoides biaculeatus | |
| Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus | |
| Bentstick Pipefish, Bend Stick | Species or species habitat may occur within area |

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|---|---|---|
| Pipefish, Short-tailed Pipefish [66280] | | |
| Urocampus carinirostris | | |
| Hairy Pipefish [66282] | | Species or species habitat may occur within area |
| Vanacampus margaritifer | | |
| Mother-of-pearl Pipefish [66283] | | Species or species habitat may occur within area |
| Mammals | | |
| Arctocephalus forsteri | | |
| New Zealand Fur-seal [20] | | Species or species habitat may occur within area |
| Arctocephalus pusillus | | |
| Australian Fur-seal, Australo-African Fur-seal [21] | | Species or species habitat may occur within area |
| Reptiles | | |
| Caretta caretta | | |
| Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area |
| Chelonia mydas | | |
| Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Dermochelys coriacea | | |
| Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat known to occur within area |
| Eretmochelys imbricata | | |
| Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area |
| Pelamis platurus | | |
| Yellow-bellied Seasnake [1091] | | Species or species habitat may occur within area |

**Whales and Other Cetaceans** **[ Resource Information ]**

| Name | Status | Type of Presence |
|---|---|---|
| Mammals | | |
| Balaenoptera acutorostrata | | |
| Minke Whale [33] | | Species or species habitat may occur within area |
| Balaenoptera edeni | | |
| Bryde's Whale [35] | | Species or species habitat may occur within area |
| Balaenoptera musculus | | |
| Blue Whale [36] | Endangered | Species or species habitat may occur within area |
| Caperea marginata | | |
| Pygmy Right Whale [39] | | Species or species habitat may occur within area |
| Delphinus delphis | | |
| Common Dophin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| Eubalaena australis | | |
| Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within |
| Grampus griseus | | |
| Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| Lagenorhynchus obscurus | | |
| Dusky Dolphin [43] | | Species or species habitat may occur within area |
| Megaptera novaeangliae | | |

| | | |
|---|---|---|
| Humpback Whale [38]<br>Orcinus orca | Vulnerable | Species or species habitat known to occur within |
| Killer Whale, Orca [46]<br>Stenella attenuata | | Species or species habitat may occur within area |
| Spotted Dolphin, Pantropical Spotted Dolphin [51]<br>Tursiops aduncus | | Species or species habitat may occur within area |
| Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]<br>Tursiops truncatus s. str. | | Species or species habitat likely to occur within |
| Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |

## Extra Information

### Places on the RNE [ Resource Information ]

Note that not all Indigenous sites may be listed.

| Name | Status |
|---|---|
| **Natural** | |
| Barrington Tops Wilderness Area NSW | Indicative Place |
| Seal Rocks and Surrounding Area NSW | Indicative Place |
| Tea Gardens Wetland NSW | Indicative Place |
| Wallis Lake NSW | Indicative Place |
| Alum Mountain Geological Site 1 NSW | Registered |
| Bandicoot Island Nature Reserve NSW | Registered |
| Cape Hawke Coastal Area NSW | Registered |
| Coolongolook Nature Reserve NSW | Registered |
| Corrie Island NSW | Registered |
| Mills Island Nature Reserve NSW | Registered |
| Myall Lakes National Park NSW | Registered |
| Port Stephens Estuary NSW | Registered |
| Regatta Island Nature Reserve NSW | Registered |
| Seal Rocks Littoral Rainforest NSW | Registered |
| Seal Rocks Nature Reserve NSW | Registered |
| Wallis Island Nature Reserve NSW | Registered |
| Yahoo Island Nature Reserve NSW | Registered |
| **Indigenous** | |
| Dark Point Midden and Stone Working Area NSW | Registered |
| Yagon Gibber Area NSW | Registered |
| **Historic** | |
| Bulahdelah Showground NSW | Indicative Place |
| Port Stephens NSW | Indicative Place |
| Stroud Showground & Grandstand NSW | Indicative Place |
| Wallamba District Showground NSW | Indicative Place |
| Booral House NSW | Registered |
| Bulahdelah Courthouse (former) NSW | Registered |
| Carrington Cemetery NSW | Registered |
| Gundayne and Outbuildings NSW | Registered |
| Karuah River Road Bridge NSW | Registered |
| Public School and Headmasters Residence NSW | Registered |
| Quambi NSW | Registered |

| | |
|---|---|
| St John the Evangelist Anglican Church & Cemetery NSW | Registered |
| St John the Evangelist Anglican Church Group NSW | Registered |
| St Johns Anglican Rectory NSW | Registered |
| St Johns Parish Hall NSW | Registered |
| Stroud Conservation Area NSW | Registered |
| Stroud Courthouse (former) NSW | Registered |
| Stroud House NSW | Registered |
| Sugarloaf Point Lighthouse (Commonwealth) NSW | Registered |
| Sugarloaf Point Lightstation NSW | Registered |
| Tahlee House Grounds, Structures and Outbuildings NSW | Registered |
| Tahlee House Group NSW | Registered |
| Tahlee House Reception and Ballroom Wing NSW | Registered |

## State and Territory Reserves [ Resource Information ]

Booti Booti, NSW
Corrie Island, NSW
Karuah, NSW
Myall Lakes, NSW
Bull Island, NSW
Darawank, NSW
Gir-um-bit, NSW
Black Bulga, NSW
Barrington Tops, NSW
Port Stephens - Great Lakes, NSW
Seal Rocks, NSW
Smiths Lake, NSW
Karuah, NSW
Durands Island, NSW
Flat Island, NSW
Bandicoot Island, NSW
Wallaroo, NSW
Mills Island, NSW
Wallingat, NSW
Bulahdelah, NSW
Regatta Island, NSW
Karuah, NSW
The Glen, NSW
Monkerai, NSW
Yahoo Island, NSW
Coolongolook, NSW
Ghin-Doo-Ee, NSW
Wallis Island, NSW

## Regional Forest Agreements [ Resource Information ]

Note that all areas with completed RFAs have been included.

North East NSW RFA, New South Wales

## Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| **Frogs** | | |
| Bufo marinus<br>Cane Toad [1772] | | Species or species habitat likely to occur within area |
| Bubalus bubalis<br>Water Buffalo, Swamp Buffalo [1] | | Species or species habitat may occur within area |
| Capra hircus<br>Goat [2] | | Species or species habitat may occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat may occur within area |
| Sus scrofa<br>Pig [6] | | Species or species habitat may occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| Cabomba caroliniana<br>Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] | | Species or species habitat may occur within area |
| Chrysanthemoides monilifera<br>Bitou Bush, Boneseed [18983] | | Species or species habitat likely to occur within area |
| Genista sp. X Genista monspessulana<br>Broom [67538] | | Species or species habitat may occur within area |
| Lantana camara<br>Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] | | Species or species habitat likely to occur within area |
| Lycium ferocissimum<br>African Boxthorn, Boxthorn [19235] | | Species or species habitat may occur within area |
| Nassella trichotoma<br>Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | | Species or species habitat may occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |

| | |
|---|---|
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | Species or species habitat likely to occur within area |
| Salvinia molesta<br>Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665] | Species or species habitat likely to occur within area |
| Ulex europaeus<br>Gorse, Furze [7693] | Species or species habitat may occur within area |

**Nationally Important Wetlands** **[ Resource Information ]**

Wallis Lake and adjacent estuarine islands, NSW
Myall Lakes, NSW
Port Stephens Estuary, NSW

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:
- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:
- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.



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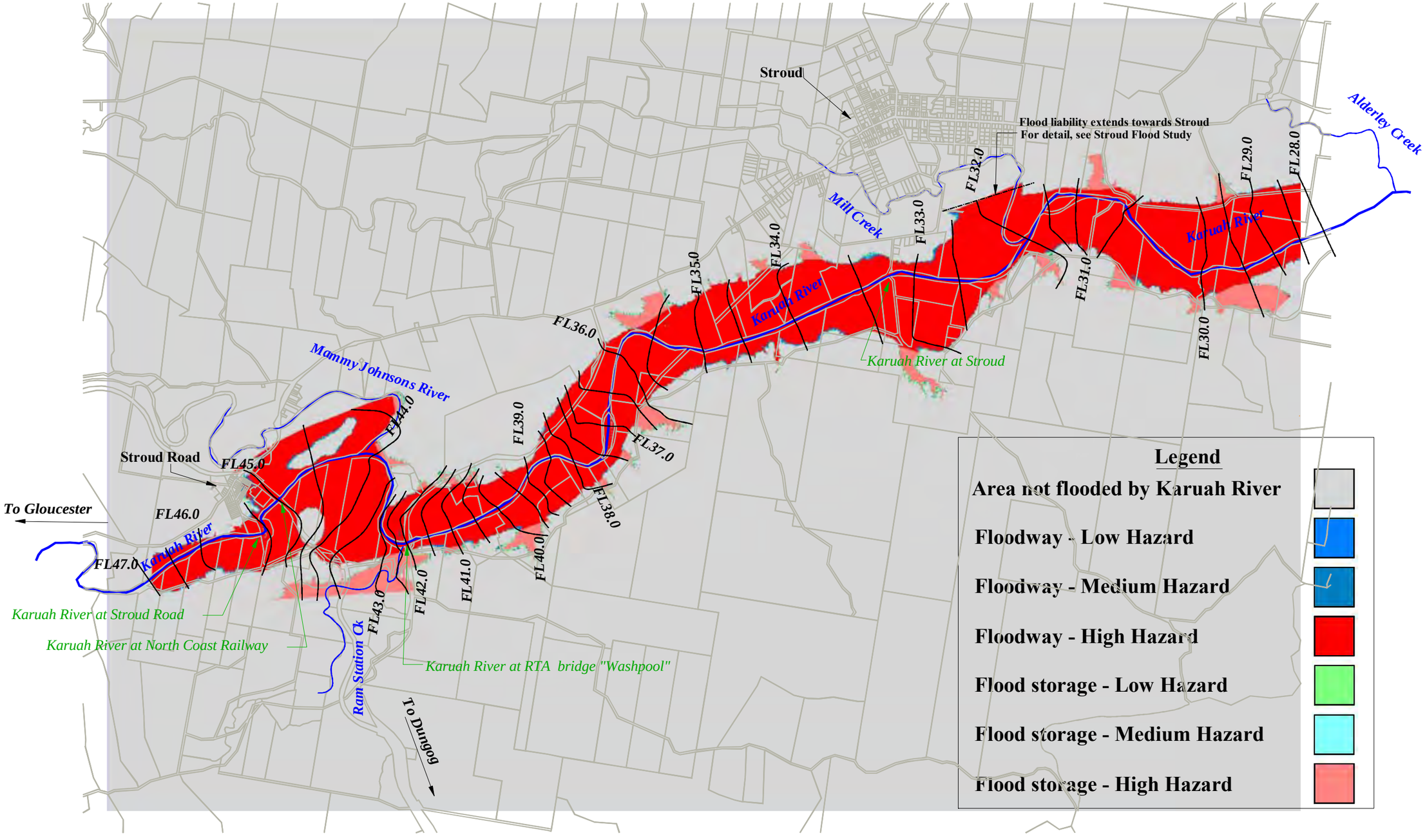
# GREAT LAKES COUNCIL
# KARUAH RIVER FLOOD STUDY




12 FEB 2010
DISC REF: 07012
FILE REF: 07012_38_PROV. HAZARD_PMF_SH1_V2

**FIGURE 38**
**PROVISIONAL FLOOD HAZARD PMF - SHEET 1**

# Gloucester Local Environmental Plan 2010

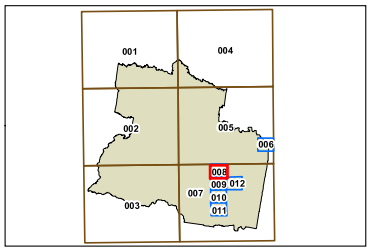
## Flood Planning Map - Sheet FLD_008

**Flood Planning Area**

Flood Planning Land

Cadastre

Cadastre 10/12/08 © Gloucester Council

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Projection: GDA 1994
Zone 56

Map Identification Number:
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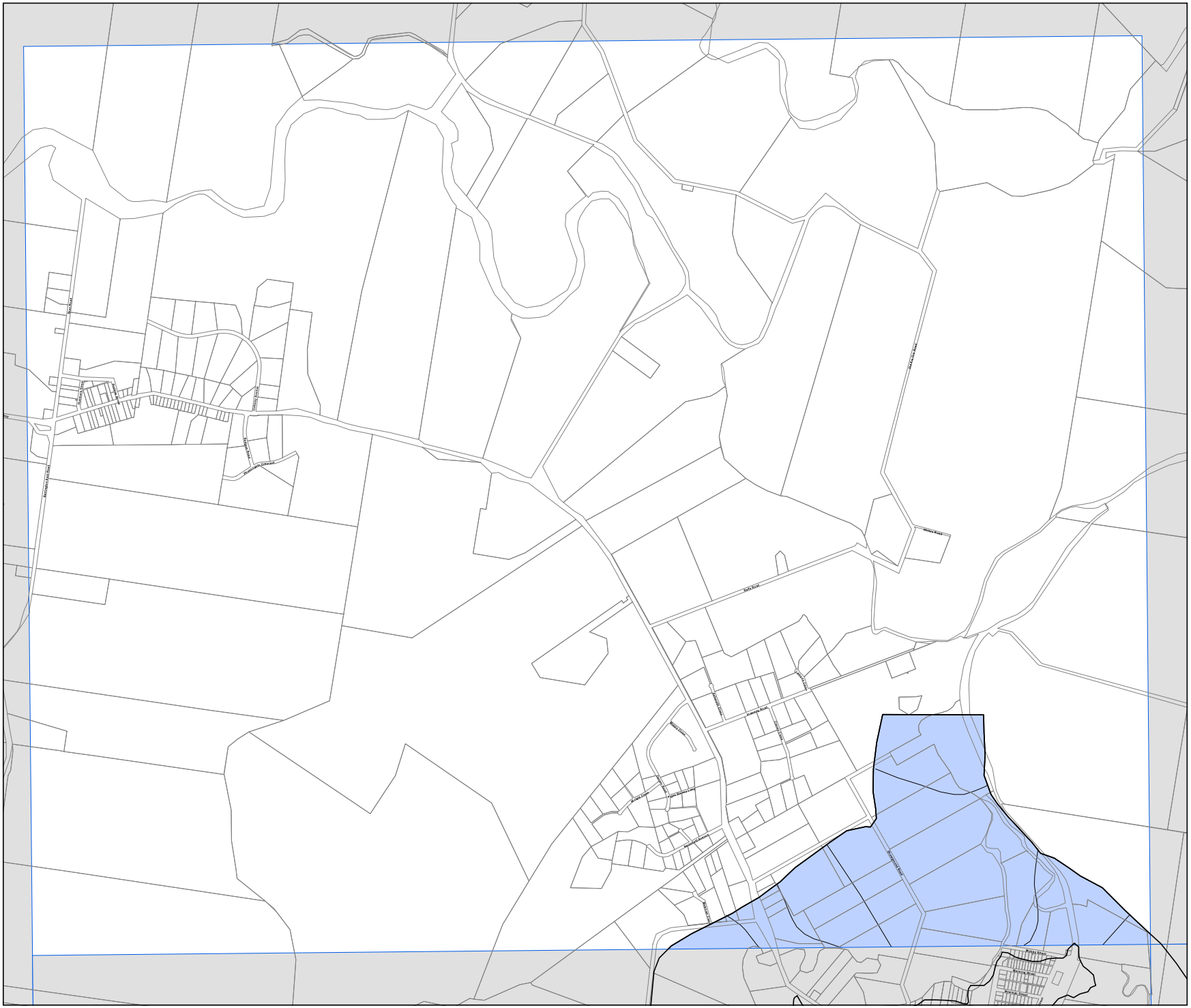


# Gloucester Local Environmental Plan 2010

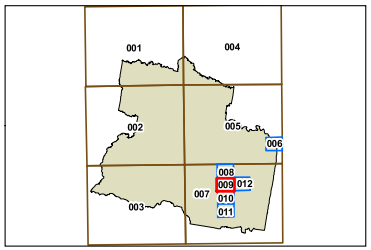
## Flood Planning Map - Sheet FLD_009

**Flood Planning Area**

Flood Planning Land

Cadastre

Cadastre 10/12/08 © Gloucester Council

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Scale: 1:20,000 @ A3

Projection: GDA 1994
Zone 56

Map Identification Number:
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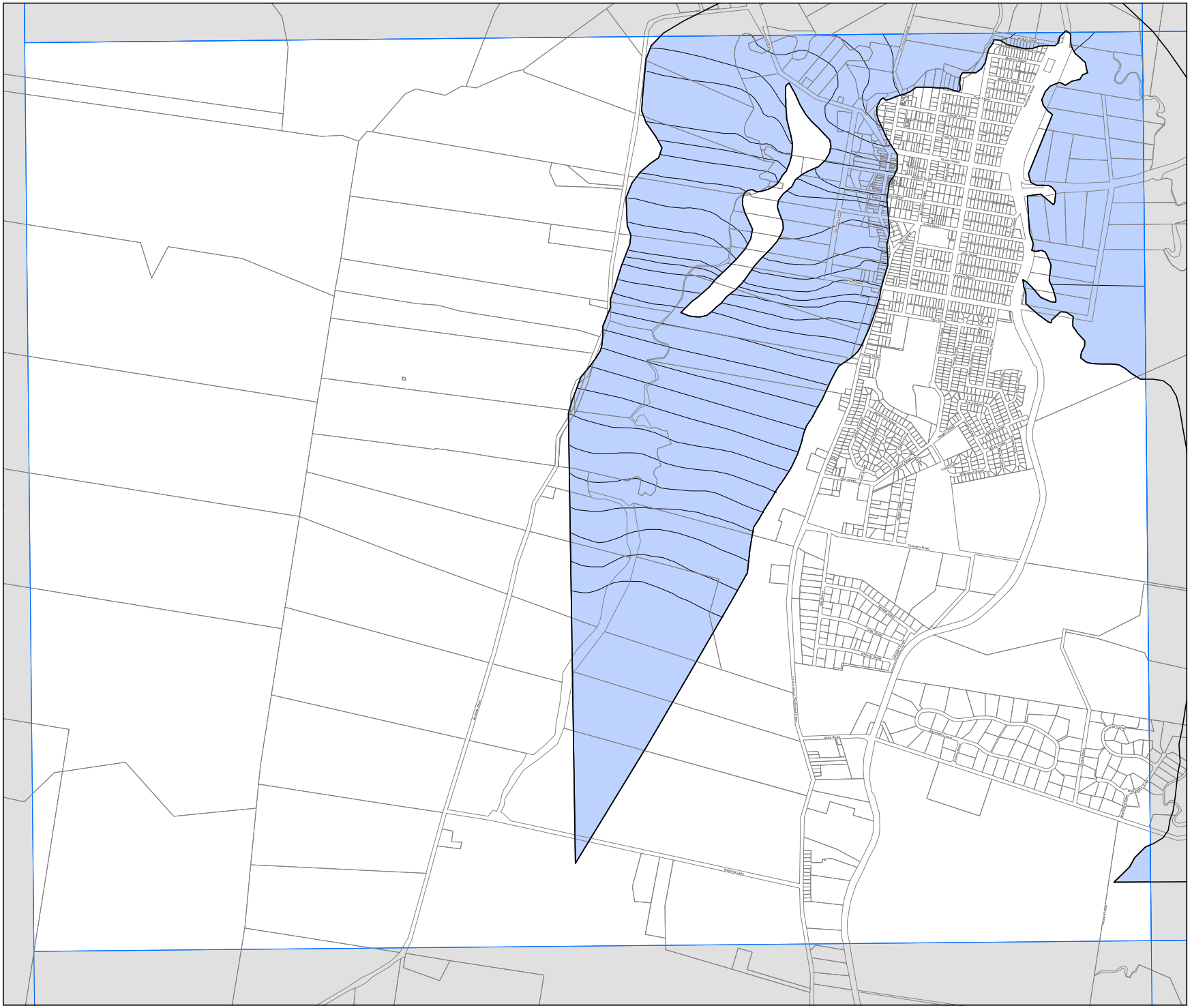


# Gloucester Local Environmental Plan 2010

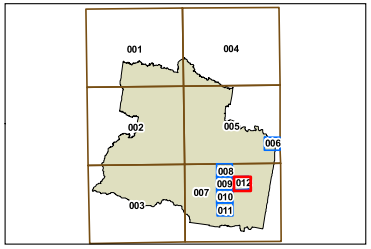
## Flood Planning Map - Sheet FLD_012

**Flood Planning Area**

Flood Planning Land

Cadastre

Cadastre 10/12/2008 © Gloucester Council




N

0 100 200 300 400 500 Metres

Scale: 1:20,000 @ A3

Projection: GDA 1994
Zone 56

Map Identification Number:
3050_COM_FLD_012_020_20100517

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref Number : J11034/35

Client Service ID : 46597

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 30-4-0006 | Barrington Burial Site; Barrington West | AGD | 56 | 396200 | 6460000 | Open site | Valid | Burial : - | Burial/s | |
| **Contact** | | **Recorders** | H Cooke,D.C Hardman,W Cook,Noma Naylor,Robert Cook | | | | | **Permits** | | |
| 38-1-0038 | AGLG 1 (same as 38-1-0037) | GDA | 56 | 397462 | 6439957 | Open site | Valid | Artefact : - | | |
| **Contact** | | **Recorders** | MCH - McCardle Cultural Heritage Pty Ltd | | | | | **Permits** | | |
| 38-1-0035 | AGL Gloucester PAD 1: Ward's River 2 (same as 38-1-0036) | AGD | 56 | 399254 | 6436341 | Open site | Valid | Potential Archaeological Deposit (PAD) : 0 | | |
| **Contact** | | **Recorders** | Ms.Penny Mccardle | | | | | **Permits** | 3166 | |
| 38-1-0051 | LEA3 | GDA | 56 | 402096 | 6449859 | Open site | Valid | Artefact : 1 | | |
| **Contact** | | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0054 | LEA6 | GDA | 56 | 394945 | 6410460 | Open site | Valid | Artefact : 1 | | |
| **Contact** | | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0061 | PAD6 (Dungog) | GDA | 56 | 397686 | 6417213 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| **Contact** | | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0062 | PAD7 (Dungog) | GDA | 56 | 396931 | 6417094 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| **Contact** | | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0064 | PAD9 (Dungog) | GDA | 56 | 393045 | 6409114 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| **Contact** | | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0041 | DM4 Duralie Mine 4 | GDA | 56 | 399903 | 6429400 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| **Contact** | | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0048 | DM11 Duralie Mine 11 | GDA | 56 | 399039 | 6428901 | Open site | Valid | Artefact : 1 | | |
| **Contact** | | **Recorders** | Kayandel Archaeological Services | | | | | **Permits** | | |
| 38-1-0073 | Gloucester Corroboree Ground | GDA | 56 | 401917 | 6457955 | Open site | Valid | Aboriginal Ceremony and Dreaming : -, Ceremonial Ring (Stone or Earth) : -, Potential Archaeological Deposit (PAD) : - | | |

**Report generated by AHIMS Web Service on 12/07/2011 for Andrew Wiltshire for the following area at Datum :GDA, Zone : 56, Eastings : 388953 - 413589, Northings : 6403318 - 6468259 with a Buffer of 0 meters.Additional Info : Supporting information for an REF. Number of Aboriginal sites and Aboriginal objects found is 53**

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref Number : J11034/35

Client Service ID : 46597

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Contact** | **Recorders** | Mr.Steve Brereton | | | | | **Permits** | | |
| 38-1-0069 | Gloucester RY 2 | GDA | 56 | 404672 | 6452597 | Open site | Valid | Artefact : 1 | | |
| | **Contact** Mr.Robert Yettica | **Recorders** | Mr.Robert Yettica | | | | | **Permits** | | |
| 38-1-0055 | LEA7 | GDA | 56 | 394770 | 6410201 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0065 | PAD10 (Dungog) | GDA | 56 | 391213 | 6407650 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 30-4-0002 | Gloucester Ridgeview | AGD | 56 | 404400 | 6459500 | Open site | Valid | Stone Arrangement : - | Stone Arrangement | |
| | **Contact** | **Recorders** | Ray Kelly | | | | | **Permits** | | |
| 38-1-0068 | Gloucester RY 1 | GDA | 56 | 405026 | 6452991 | Open site | Valid | Artefact : 1 | | |
| | **Contact** Mr.Robert Yettica | **Recorders** | Mr.Robert Yettica | | | | | **Permits** | | |
| 38-1-0006 | Washpool Bridge; | AGD | 56 | 397660 | 6417050 | Open site | Valid | Ceremonial Ring (Stone or Earth) : - | Bora/Ceremonial | |
| | **Contact** | **Recorders** | Mr.Brian Wythes | | | | | **Permits** | | |
| 38-1-0036 | PAD1: Wards River 2 | AGD | 56 | 399254 | 6436341 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Ms.Penny Mccardle | | | | | **Permits** | 3171 | |
| 38-1-0050 | LEA2 | GDA | 56 | 402011 | 6449027 | Open site | Valid | Artefact : 2 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0039 | DM2 Duralie Mine 2 | GDA | 56 | 399031 | 6429240 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0044 | DM7 Duralie Mine 7 | GDA | 56 | 401058 | 6424633 | Open site | Valid | Artefact : 6 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0028 | Restriction applied. Please contact ahims@environment.nsw.gov.au. | | | | | Open site | Valid | | | |
| | **Contact** | **Recorders** | Mick Leon | | | | | **Permits** | | |
| 38-1-0003 | Gloucester | AGD | 56 | 402054 | 6457596 | Open site | Valid | Modified Tree (Carved or Scarred) : - | Carved Tree | |
| | **Contact** | **Recorders** | David Bell | | | | | **Permits** | | |
| 38-1-0008 | Craven Parkers Road | AGD | 56 | 402890 | 6442590 | Open site | Valid | Artefact : 4 | Open Camp Site | 835 |
| | **Contact** | **Recorders** | Helen Brayshaw | | | | | **Permits** | | |
| 37-2-0336 | MAN 31;Mt Arthur North; | AGD | 56 | 398700 | 6421900 | Open site | Valid | Artefact : - | Open Camp Site | 1203,1204 |

**Report generated by AHIMS Web Service on 12/07/2011 for Andrew Wiltshire for the following area at Datum :GDA, Zone : 56, Eastings : 388953 - 413589, Northings : 6403318 - 6468259 with a Buffer of 0 meters.Additional Info : Supporting information for an REF. Number of Aboriginal sites and Aboriginal objects found is 53**

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref Number : J11034/35

Client Service ID : 46597

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Contact** | **Recorders** | Margrit Koettig | | | | | **Permits** | 147 | |
| 38-1-0056 | PAD1 (Gloucester) | GDA | 56 | 404041 | 6450702 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0040 | DM3 Duralie Mine 3 | GDA | 56 | 400072 | 6429178 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0027 | Honey Scarred Tree | AGD | 56 | 401200 | 6425800 | Open site | Valid | Modified Tree (Carved or Scarred) : - | Open Camp Site,Scarred Tree | |
| | **Contact** | **Recorders** | Michael Green | | | | | **Permits** | | |
| 38-1-0037 | AGLG 1 | AGD | 56 | 397462 | 6439957 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Ms.Penny Mccardle | | | | | **Permits** | 3172 | |
| 38-1-0049 | LEA1 | GDA | 56 | 402611 | 6452503 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0052 | LEA4 | GDA | 56 | 398996 | 6442117 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0042 | DM5 Duralie MIne 5 | GDA | 56 | 399522 | 6427990 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0043 | DM6 Duralie Mine 6 | GDA | 56 | 400187 | 6428274 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-2-0095 | Winns Creek Trail 2 | AGD | 56 | 412130 | 6416560 | Open site | Valid | Artefact : - | Isolated Find | 99964 |
| | **Contact** | **Recorders** | Keith Gleeson | | | | | **Permits** | | |
| 38-1-0034 | Mammy Johnson's Grave | AGD | 56 | 400912 | 6424723 | Open site | Valid | Burial : - | | |
| | **Contact** Ms.Dianne Stephenson | **Recorders** | Mr.Steve Brereton | | | | | **Permits** | | |
| 38-1-0004 | Stroud. | AGD | 56 | 403333 | 6413463 | Open site | Valid | Artefact : -, Ceremonial Ring (Stone or Earth) : - | Bora/Ceremonial,Open Camp Site | |
| | **Contact** | **Recorders** | Unknown Author | | | | | **Permits** | | |
| 38-1-0010 | Little Black Camp Creek; | AGD | 56 | 390980 | 6404750 | Open site | Partially Destroyed | Artefact : - | Open Camp Site | 1333 |
| | **Contact** | **Recorders** | Warren Bluff | | | | | **Permits** | | |
| 37-2-0337 | MAN 32;Mt Arthur North; | AGD | 56 | 398700 | 6421800 | Open site | Valid | Artefact : - | Open Camp Site | 1203,1204 |
| | **Contact** | **Recorders** | Margrit Koettig | | | | | **Permits** | 147 | |

**Report generated by AHIMS Web Service on 12/07/2011 for Andrew Wiltshire for the following area at Datum :GDA, Zone : 56, Eastings : 388953 - 413589, Northings : 6403318 - 6468259 with a Buffer of 0 meters.Additional Info : Supporting information for an REF. Number of Aboriginal sites and Aboriginal objects found is 53**

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref Number : J11034/35

Client Service ID : 46597

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 38-1-0053 | LEA5 | GDA | 56 | 398904 | 6440693 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0045 | DM8 Duralie Mine 8 | GDA | 56 | 401206 | 6424225 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0047 | DM10 Duralie Mine 10 | GDA | 56 | 398559 | 6428770 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0058 | PAD3 (Craven) | GDA | 56 | 399052 | 6439671 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0033 | Honey Tree (002) | AGD | 56 | 401160 | 6426300 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | 101742 |
| | **Contact** | **Recorders** | Barry Cain | | | | | **Permits** | | |
| 37-2-0348 | MAN 25;Mt Arthur North; | AGD | 56 | 399900 | 6421200 | Open site | Valid | Artefact : - | Open Camp Site | 1203,1204 |
| | **Contact** | **Recorders** | Margrit Koettig | | | | | **Permits** | 147 | |
| 30-5-0005 | Tugrabakh; | AGD | 56 | 406000 | 6463000 | Open site | Valid | Ceremonial Ring (Stone or Earth) : - | Bora/Ceremonial | |
| | **Contact** | **Recorders** | E Nixon | | | | | **Permits** | | |
| 38-1-0046 | DM9 Duralie Mine 9 | GDA | 56 | 398618 | 6428791 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.Lance Syme | | | | | **Permits** | | |
| 38-1-0057 | PAD2 (Craven) | GDA | 56 | 399018 | 6439629 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0059 | PAD4 (Craven) | GDA | 56 | 399575 | 6436300 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0060 | PAD5 (Craven) | GDA | 56 | 399540 | 6434799 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |
| 38-1-0063 | PAD8 (Dungog) | GDA | 56 | 394950 | 6410465 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** | **Recorders** | Mr.Rick Bullers | | | | | **Permits** | | |

**Report generated by AHIMS Web Service on 12/07/2011 for Andrew Wiltshire for the following area at Datum :GDA, Zone : 56, Eastings : 388953 - 413589, Northings : 6403318 - 6468259 with a Buffer of 0 meters.Additional Info : Supporting information for an REF. Number of Aboriginal sites and Aboriginal objects found is 53**

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref Number : J11034/35

Client Service ID : 46597

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 38-2-0092 | Darren 1 | AGD | 56 | 412050 | 6424000 | Open site | Valid | Artefact : - | Isolated Find | |
| | **Contact** | **Recorders** | Keith Gleeson | | | | | **Permits** | | |
| 38-2-0093 | Darren 2 | AGD | 56 | 411220 | 6420200 | Open site | Valid | Artefact : - | Isolated Find | 99964 |
| | **Contact** | **Recorders** | Keith Gleeson | | | | | **Permits** | | |
| 38-1-0031 | Isolated find no1 | AGD | 56 | 402400 | 6446625 | Open site | Destroyed | Artefact : - | | 98114 |
| | **Contact** | **Recorders** | Louise Gay,Robert Paulson | | | | | **Permits** | 1374,2857,2858 | |

**Report generated by AHIMS Web Service on 12/07/2011 for Andrew Wiltshire for the following area at Datum :GDA, Zone : 56, Eastings : 388953 - 413589, Northings : 6403318 - 6468259 with a Buffer of 0 meters.Additional Info : Supporting information for an REF. Number of Aboriginal sites and Aboriginal objects found is 53**

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# Appendix C

## Assessment of significance

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# Seismic REF Ecological Impact Assessment

2D Seismic Survey

Prepared for AGL Upstream Investments Pty Ltd | 5 October 2011

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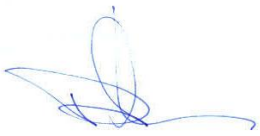
# Seismic REF Ecological Impact Assessment

Final Report

Prepared for AGL Upstream Investments Pty Ltd| 5 October 2011

| | | | |
|---|---|---|---|
| Prepared by | **Renae Baker** | Approved by | **Duncan Peake** |
| Position | Senior Technical Advisor- Ecology | Position | Senior Associate |
| Signature |  | Signature |  |
| Date | 5 October 2011 | Date | 5 October 2011 |

This Report has been prepared in accordance with the brief provided by the Client and has relied upon the information collected at or under the times and conditions specified in the Report. All findings, conclusions or recommendations contained within the Report are based only on the aforementioned circumstances. Furthermore, the Report is for the use of the Client only and no responsibility will be taken for its use by other parties.

**Document Control**

| Version | Date | Prepared by | Reviewed by |
|---|---|---|---|
| V1 | 5 October 2011 | Renae Baker | Cassandra Thompson |
| V2 | 5 October 2011 | Renae Baker | Duncan Peake |
| | | | |
| | | | |
| | | | |

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# Table of Contents



## Figures



## Tables

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# 1 Introduction

This document provides an impact assessment and assessments of significance undertaken for threatened species considered to have the potential to be impacted by the proposed 2D seismic survey.

# 2 Methods

## 2.1 Database searches

Database searches using a 10 km radius were undertaken to provide up to date information on the threatened species and endangered ecological communities that have the potential to occur within Petroleum Exploration Licence No. 285 (PEL). This included searches of:

- the National Parks and Wildlife Service (NPWS) Wildlife Atlas of NSW for species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act); and
- protected matters search for matters of National Environmental Significance (NES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 2.1 provides the results of the database searches.

**Table 2.1 Database search results for threatened species within a 10 km radius of the PEL**

| **Species** | | **Conservation Status** | |
|---|---|---|---|
| Scientific Name | Common Name | TSC Act | EPBC Act |
| Flora | | | |
| *Allocasuarina defungens* | Dwarf Heath Casuarina | E | E |
| *Allocasuarina defungens* | Dwarf Heath Casuarinz | E | E |
| *Angophora inopina* | Charmhaven Apple | V | V |
| *Asperula asthenes* | Trailing Woodruff | V | V |
| *Callistemon linearifolius* | Netted Bottlebrush | V | - |
| *Cryptostylis hunteriana* | Leafless Tongue-orchid | V | V |
| *Cynanchum elegans* | White-flowered Wax Plant | E | E |
| *Eucalyptus glaucina* | Slaty Red Gum | V | V |
| *Euphrasia arguta* | | Proposed CE | CE |
| *Grevillea guthrieana* | Guthrie's Grevillea | E | E |
| *Melaleuca biconvexa* | Biconvex Melaleuca | V | V |
| *Parsonsia dorrigoensis* | Milky Silkpod | V | E |
| *Pomaderris queenslandica* | Scant Pomaderris | E | - |
| *Senna acclinis* | Rainforest Cassia (Senna) | E | - |
| *Syzygium paniculatum* | Magenta Lily Pilly | E | V |
| *Tetratheca juncea* | Black Eyed Susan | V | V |
| Birds | | | |
| *Circus assimilis* | Spotted Harrier | V | - |
| *Hieraaetus morphnoides* | Little Eagle | V | - |

## Table 2.1 Database search results for threatened species within a 10 km radius of the PEL

| **Species** | | **Conservation Status** | |
|---|---|---|---|
| Scientific Name | Common Name | TSC Act | EPBC Act |
| *Melanodryas cucullata cucullata* | Hooded Robin | V | - |
| *Petroica multicolor* | Scarlet Robin | V | - |
| *Petroica phoenicea* | Flame Robin | V | - |
| *Callocephalon fimbriatum* | Gang-gang Cockatoo | V | - |
| *Glossopsitta pusilla* | Little Lorikeet | V | - |
| *Calyptorhynchus lathami* | Glossy Black-Cockatoo | V | - |
| *Lathamus discolor* | Swift Parrot | E | E |
| *Ninox strenua* | Powerful Owl | V | - |
| *Tyto capensis* | Grass Owl | V | - |
| *Tyto tenebricosa* | Sooty Owl | V | - |
| *Tyto novaehollandiae* | Masked Owl | V | - |
| *Anthochaera phrygia* | Regent Honeyeater | CE | E |
| *Melithreptus gularis* | Black-chinned Honeyeater | V | - |
| *Climacteris picumnus* | Brown Treecreeper | V | - |
| *Daphoenositta chrysoptera* | Varied Sittella | V | - |
| *Pomatostomus temporalis temporalis* | Grey-crowned Babbler (eastern subspecies) | V | - |
| *Pyrrholaemus saggitatus* | Speckled Warbler | V | - |
| *Ptilinopus magnificus* | Wompoo Fruit-Dove | V | - |
| *Ptilinopus regina* | Rose-crowned Fruit Dove | V | - |
| *Botaurus poiciloptilus* | Australasian Bittern | E | E |
| *Ephippiorhynchus asiaticus* | Black-necked Stork | E | - |
| *Irediparra gallinacea* | Comb-crested Jacana | V | - |
| Arboreal Mammals | | | |
| *Petaurus norfolcensis* | Squirrel Glider | V | - |
| *Petaurus australis* | Yellow-bellied Glider | V | - |
| *Phascolarctos cinereus* | Koala | V | - |
| Ground-dwelling Mammals | | | |
| *Dasyurus maculatus* | Spotted-tailed Quoll | V | E (SE population) |
| *Petrogale penicillata* | Brush-tailed Rock-wallaby | E | V |
| *Macropus parma* | Parma Wallaby | v | - |
| *Potorous tridactylus tridactylus* | Long-nosed Potoroo | V | V |
| *Thylogale stigmatica* | Red-legged Pademelon | V | - |
| *Pseudomys novaehollandiae* | New Holland Mouse | - | V |
| *Pseudomys oralis* | Hastings River Mouse | E | E |
| *Cecartetus nanus* | Eastern Pygmy-possum | V | - |
| *Planigale maculata* | Common Planigale | V | - |
| Bats and Flying-foxes | | | |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | V | - |
| *Miniopterus australis* | Little Bentwing Bat | V | - |

**Table 2.1 Database search results for threatened species within a 10 km radius of the PEL**

| Species | | Conservation Status | |
|---|---|---|---|
| Scientific Name | Common Name | TSC Act | EPBC Act |
| *Miniopterus schreibersii oceanensis* | Eastern Bentwing-bat | V | - |
| *Mormopterus norfolkensis* | Eastern Freetail-bat | V | - |
| *Myotis macropus* | Southern Myotis | V | - |
| *Scoteanax rueppellii* | Greater Broad-nosed Bat | V | - |
| *Phascogale tapoatafa* | Brush-Tailed Phascogale | V | - |
| *Vespadelus troughtoni* | Eastern Cave Bat | V | - |
| *Kerivoula papuensis* | Golden-tipped Bat | V | - |
| *Chalinolobus dwyeri* | Large-eared Pied Bat | V | V |
| Reptiles | | | |
| *Hoplocephalus bungaroides* | Broad-headed Snake | E | V |
| *Hoplocephalus stephensi* | Stephens Banded Snake | | |
| Amphibians | | | |
| *Litoria daviesae* | Davies Tree Frog | V | - |
| *Litoria brevipalmata* | Green-thighed Frog | V | - |
| *Litoria aurea* | Green and Golden Bell Frog | E | V |
| *Litoria booroolongensis* | Booroolong Frog | E | E |
| *Mixophyes balbus* | Stuttering Frog, Southern | E | V |
| *Mixophyes iteratus* | Giant Barred Frog, | E | E |

*V = Vulnerable, E = Endangered, CE = Critically Endangered, SE population = southeastern mainland population*

A review of relevant literature was also undertaken to gain an appreciation of the ecology of the study area and the region. In particular, this included a detailed review of AECOM (2009), as this REF was undertaken within the vicinity of the current project.

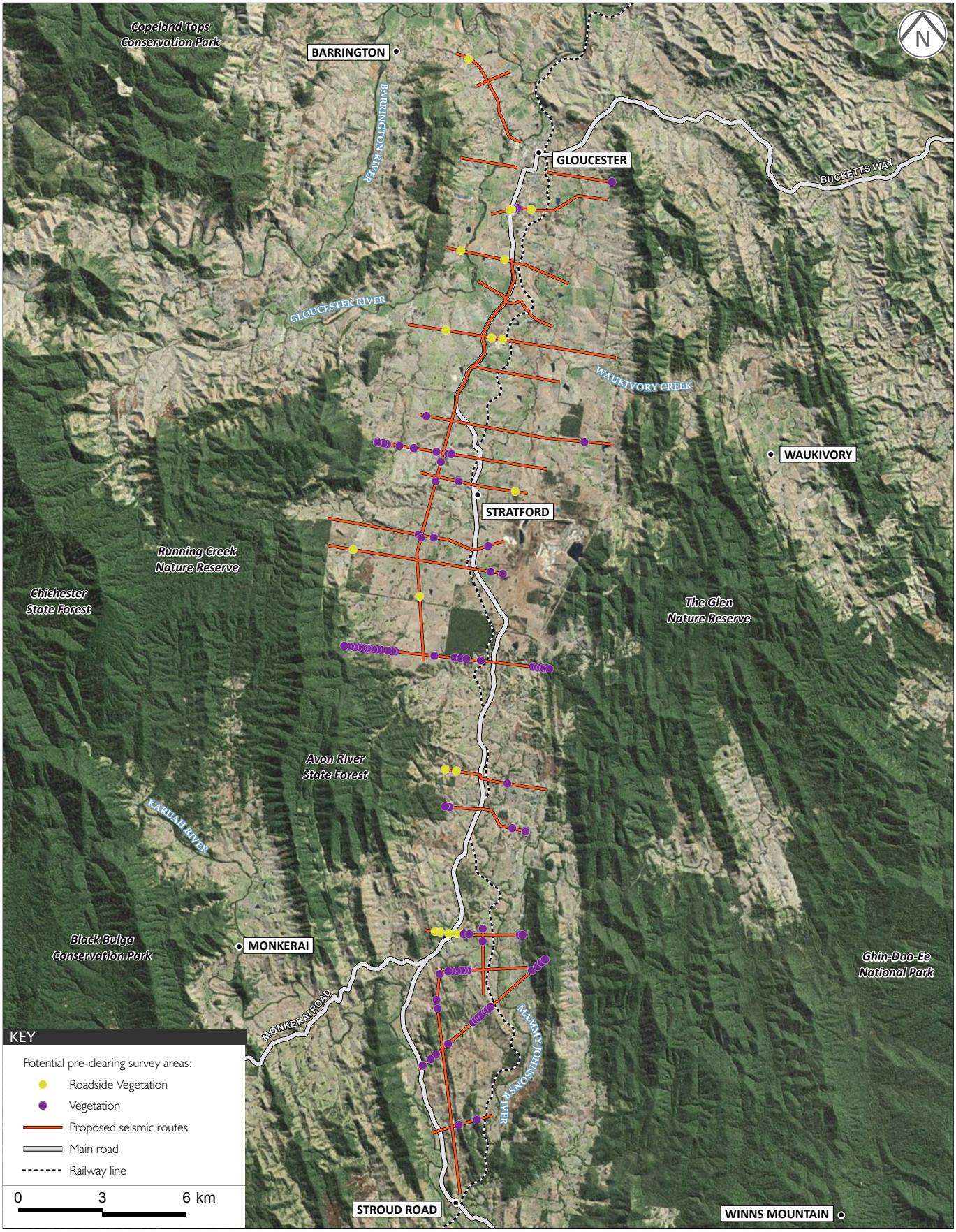
## 2.2 Management and mitigation measures

An impact assessment was undertaken for those species considered likely to occur within the study area and be potentially impacted by the proposed works (ie where slashing will occur). Slashing is not expected to occur across all areas of the seismic survey. Where a watercourse is encountered no slashing will occur and the geophone receivers will be laid up to the edge of watercourse and then cable laid across to the opposite side of the watercourse where the geophones can continue. Vehicles will use existing crossings to travel to the opposite side of any river or creek and continue the survey without crossing any watercourse where a suitable established crossing does not already exist.

As described in Section 2.2 of the REF, the vehicles used for the proposed works are optimised for minimal impact and are flexible in terms of manoeuvrability. Where proposed routes have been identified as having potential to have sensitive vegetation no slashing will occur and there would be no requirements for an ecological survey or walk-over. However, if an area of sensitive vegetation has been identified where some slashing is required to undertake the seismic survey a pre-clearance survey by an ecologist will be required. Potential sensitive areas were identified through an analysis of the seismic routes, aerial photography and available vegetation mapping. These areas are shown in Figure C.1.

In determining the significance of potential impacts, the following proposed mitigation and management measures were considered:

- in identified sensitive areas (refer to Figure C.1) which cannot be avoided and if some slashing is to occur, a pre-clearance survey will be undertaken by an experienced ecologist. The project ecologist will provide advice to the survey team to plan the seismic survey route to minimise potential impacts to these areas. If required, this survey will include:
  - the identification, marking and avoidance of threatened plants and bird nests;
  - a 10 m 'no slashing' buffer zone established around hollow-bearing trees to maintain groundcover and minimise potential impacts to resident fauna;
  - a 20 m 'no slashing' buffer zone established to maintain groundcover where owl or Glossy-black Cockatoo (*Calyptorhynchus lathami*) nest sites are identified;
  - woody ground debris moved by hand and replaced in original location under the supervision of the ecologist;
  - a 10 m 'no slashing' buffer zone established around identified threatened frog habitats; and
  - avoidance of areas of EEC.
- the environmental management plan will be updated to include:
  - on-site environmental management to advise contractors and other on-site personnel on ways of minimising ecological impacts. Personnel should be briefed on the importance of the Grey-crowned babbler and laminated photos of this species and its nests placed in each vehicle for identification;
  - traffic control measures will be required for the works. Slower speeds should be adhered to reduce the risk of fauna injuries;
  - measures to prevent the spread or introduction of weeds at all work sites;
  - rubbish management; and
  - management of any chemicals, fuels and wastes.

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Identified potential sensitive areas for slashing

Proposed seismic survey – assessment of significance

Figure C.1

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# 3 Impact Assessment

## 3.1 Fauna

The following species guilds were considered unlikely to be impacted by the proposed works within the PEL and were not assessed further:

- wetland birds – no potential habitats will be impacted by the proposed works;
- hollow-dependent mammal species – the works would be unlikely to disturb these species as no hollow-bearing trees will be removed. A 'no work' buffer will be implemented around any hollow-bearing trees identified;
- medium sized ground-dwelling mammals – eg wallabies, bandicoots – these species are highly mobile and use general habitat types and are therefore unlikely to be impacted by the proposed works;
- large forest owls – pre-clearance surveys by an experienced ecologist will identify any potential nest sites for owls and these will be avoided and a 'no work' buffer of 20 m implemented. No other components of the proposed works would be likely to impact these species;
- Koala – no habitat for the Koala will be impacted by the proposed works and if the species were to occur within the PEL it is unlikely to be disturbed by the on-ground works;
- birds that would occur as eucalypt/canopy foragers - there is limited potential for nesting within the wooded areas for such species (e.g. Little Eagle (*Hieraaetus morphnoides*), Wompoo Fruit Dove (*Ptilinopus magnificus*), Swift Parrot (*Lathamus discolor*), Regent Honeyeater (*Anthochaera phrygia*));
- species for which no preferred habitat occurs within the survey areas (e.g. Brush-tailed Rock Wallaby (*Petrogale pencillata*), Broad-headed Snake (*Hoplocephalus bungaroides*), Spotted Tailed Quoll (*Dasyurus maculatus*)); and
- Grey-headed Flying Fox (*Pteropus poliocephalus*) – no known camp sites occur within the PEL and the species would be unlikely to be disturbed.

Some species guilds were considered to be more susceptible to the potential impacts associated with the proposed works and these species were assessed using the seven part test of significance under section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As the proposed works will implement a range of mitigation measures and is expected to have a temporary and limited impact, fauna species were grouped together in the following guilds, before applying the tests of significance:

- threatened woodland birds– potential impacts include removal of small shrubs / ground areas used as nesting sites, disturbance of breeding birds from noise and activity in the area and disturbance to foraging areas including woody debris and grasses;
- threatened microbats that utilise hollows and woody debris as shelter sites - potential impacts include disturbance to logs and other woody ground debris and possible vibration impacts where works are conducted close to habitat trees; and
- threatened frogs – potential impacts include trampling of vegetation in breeding and foraging areas.

The Common Planigale was considered separately as there are no other species similar to it considered to have the potential to occur and to be impacted by the proposed survey.

No EECs were identified by AECOM (2009) within the local area and are unlikely to occur within the PEL impact areas. However, pre-clearance surveys will be undertaken by an experienced ecologist to identify the occurrence of any EEC, and if identified, these areas will be avoided.

### 3.1.1 Woodland Birds

The following threatened woodland birds were considered to have the potential to occur within the PEL and potentially be impacted by the proposed works:

- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*);
- Speckled Warbler (*Pyrrholaemus saggitatus*);
- Scarlet Robin (*Petroica multicolour*);
- Flame Robin (*Petroica phoenicea*); and
- Hooded Robin (*Melanodryas cucullata cucullata*).

The Grey-crowned Babbler is found in open forests and woodlands, favouring inland plains with an open shrub layer, little ground cover and plenty of fallen timber and leaf litter. It can also be seen along roadsides and around farms. The Grey-crowned Babbler builds and maintains several conspicuous, dome-shaped stick nests about the size of a football. A nest is used as a dormitory for roosting each night and are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones (DEC 2005a).

The Speckled Warbler lives in dry sclerophyll forests and woodlands dominated by eucalypts. It is mostly seen on the grassy ground layer, when it is foraging. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter (DEC 2005b).

The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grass with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than two metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub (DEC 2005c).

The Flame Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. It prefers clearings or areas with open understoreys. The ground-layer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks (DEC 2005d).

The Hooded Robin prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. It requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. The Hooded Robin may breed any time between July and November, often rearing several broods. Nests are small,

neat cups of bark and grasses bound with webs, in a tree fork or crevice, from less than one metres to five metres above the ground (DEC 2005e).

Potential impacts to woodland birds as a result of the proposed works include the disturbance of woody ground debris, slashing of vegetation used as nest sites and impacts to foraging resources including grasses (native and exotic). Other potential impacts to breeding birds could result from the increased noise and general disturbance created during the proposed works.

*The following factors must be taken into account in making a determination under this section:*

*a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Potential impacts to the life cycle of woodland birds include direct disturbance to nest sites and general disturbance within the area from machinery and personnel that could disturb nesting birds.

Mitigation measures to be implemented as part of the proposed works (refer to Section 2.2) include a pre-clearance survey with an experienced ecologist to identify any bird nests and other ecologically important or sensitive areas, which will then be avoided. Nest sites and other sensitive areas will be provided with a minimum 10 m buffer.

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the action proposed is unlikely to have an adverse effect on any viable local population of woodland bird, such that it would be placed at risk of extinction.

*b) in the case of an endangered population, whether the action proposed is likely to have an adverse affect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No endangered populations of woodland bird occur within the locality.

*c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

> *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
>
> *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Not applicable to a species.

*d) in relation to the habitat of a threatened species, population or ecological community:*

> *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,*

Where the proposed survey routes are not within formed tracks or other cleared areas, the proposal could result in the slashing of grasses and shrubs up to a maximum width of 3.7 m. Woody ground debris, where encountered, will also be relocated while the seismic survey is being undertaken.

*(ii) whether an area of habitats is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The PEL occurs within a relatively cleared corridor between two larger areas of vegetation, one of which is the Barrington Tops and Gloucester Tops Important Bird Area (IBA). The proposed seismic survey routes are predominantly located along tracks, with a maximum disturbance width of 3.7 m (grasses and shrubs). Given this limited disturbance, it is considered that the proposed works will not isolate or fragment known habitat for threatened woodland birds within the locality.

*(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The local area is known as important habitat for Grey-crowned Babblers and as the PEL occurs adjacent to an IBA it is likely that other threatened bird species utilise habitats within the PEL. Native vegetation remnants within the PEL would be considered important habitat to any of the threatened woodland bird populations within the locality. However, the small areas of vegetation to be impacted by the proposed works (slashing of grasses and shrubs up to 3.7 m width) would be considered of relatively low importance to the survival of species within the locality, given the availability of resources within the greater area.

*e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)*

No areas of critical habitat have been listed for threatened woodland birds within the locality.

*f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

A number of applicable measures can assist the recovery of threatened woodland bird species including:

- retain existing woodland vegetation;
- retain dead timber on the ground in open woodland areas; and
- avoid impacts to regenerating areas.

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the survey is considered to be consistent with recovery objectives for woodland birds within the locality.

*g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process*

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), it is considered unlikely that the action will result in or increase in impact of any key threatening processes. Applicable mitigation and management measures include:

- control of weed introduction and spread;
- no removal of woody debris;
- no impacts to riparian areas;

- no impacts to significant areas of native vegetation; and
- no tree removal.

#### i. Conclusion

The proposed activity may result in minor, temporary impacts to the potential foraging habitat of threatened woodland birds known from the locality. There is also the potential for disturbance to potential habitat from indirect impacts such as machinery and work crews. However, given the management and mitigation measures to be implemented as part of the proposed works (refer to Section 2.2), impacts are expected to be minor and will not result in an adverse effect such that any of the species would be placed at risk of extinction. A Species Impact Statement is not required.

### 3.1.2 Amphibians

The following threatened amphibian species were considered to have the potential to occur within the PEL:

- Stuttering Frog (*Mixophyes balbus*);
- Green and Golden Bell Frog (*Litoria aurea*); and
- Giant Barred Frog (*Mixophyes iterates).*

Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. The Stuttering Frog breeds in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep permanent pools and take approximately 12 months to metamorphose (DEC 2005f).

The Green and Golden Bell Frog inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* sp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation (DEC 2005g).

The Giant Barred Frog forages and lives amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest. They breed around shallow, flowing rocky streams from late spring to summer. Females lay eggs on moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. When not breeding, the frogs disperse hundreds of metres away from streams (DEC 2005h).

Potential impacts to threatened frog species as a result of the proposed works include the disturbance of foraging and sheltering areas close to riparian zones. To reduce these potential impacts the following mitigation measures will be implemented as part of the proposed works (refer to Section 2.2):

- pre-clearance surveys of potential frog habitat areas;
- implementation of buffer zones around identified frog habitats; and
- avoidance of stream banks by machinery.

*The following factors must be taken into account in making a determination under this section:*

*a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Potential impacts to the life cycle of amphibians include direct disturbance to breeding areas such as pools, streams, riparian vegetation and farm dams. Direct impacts to adults, such as trampling from pedestrians or machinery, could also occur where adults are using non-breeding sheltering sites (such as leaf litter and vegetation adjacent riparian areas).

Mitigation measures to be implemented as part of the proposed works (refer to Section 2.2) include a pre-clearance survey with an experienced ecologist to identify potential frog habitats within proposed seismic survey routes, which will then be avoided and provided with a minimum 10 m buffer. Breeding areas such as streams, rocky pools and farm dams will not be impacted by works involving machinery. These areas would be traversed on foot if necessary

Given the mitigation and management measures to be implemented as part of these proposed works (refer to Section 2.2), the action proposed is unlikely to have an adverse effect on any viable local population of threatened amphibian, such that it would be placed at risk of extinction.

*b) in the case of an endangered population, whether the action proposed is likely to have an adverse affect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No endangered populations of amphibian occur within the study area.

*c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

*(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

*(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Not applicable to species.

*d) in relation to the habitat of a threatened species, population or ecological community:*

*(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,*

Where the proposed survey routes are not within formed tracks or other cleared areas, the proposal could result in the slashing of grasses and shrubs up to a maximum width of 3.7 m. Where this is to occur within potential frog sheltering or foraging habitat, a pre-clearance survey will identify sensitive habitat and a 'no works' buffer implemented. No potential breeding areas will be impacted by proposed works.

*(ii) whether an area of habitats is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The proposed works will not further isolate or fragment known habitat for amphibians, as no breeding habitat or other significant frog sheltering habitat will be removed or significantly impacted. All areas will be surveyed by an experienced ecologist prior to works beginning.

*(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Given the restricted distribution of threatened amphibians within the locality, if there were to occur within the project area then any potential habitat to be modified would be considered important to the species survival within the local area. Where these areas are identified within the project area they will be avoided and a 'no works' buffer implemented.

*e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)*

No areas of critical habitat have been listed for threatened amphibians within the locality.

*f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

A number of applicable measures can assist the recovery of threatened amphibian species including:

- ensure water quality and quantity;
- avoid impacts to known breeding areas; and
- ensure that weeds are controlled in riparian areas.

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the proposed works are considered to be consistent with the recovery of threatened amphibian species.

*g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process*

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), it is considered unlikely that the action will result in or increase the impact of any key threatening processes. Applicable mitigation and management measures include:

- control of weed introduction and spread;
- no removal of woody debris;
- no impacts to riparian areas;
- no impacts to significant areas of native vegetation; and
- no tree removal.

### i Conclusion

The proposed activity may result in minor, temporary impacts to the potential sheltering or foraging habitat for threatened amphibians within the locality. There is also the potential for disturbance to

potential habitat from indirect impacts such as machinery and work crews. However, given the management and mitigation measures to be implemented as part of the proposed works (refer to Section 2.2), impacts are expected to be minor and will not result in an adverse effect such that any of the species would be placed at risk of extinction. A Species Impact Statement is not required.

### 3.1.3 Microchiropteran Bats

The following threatened microchiropteran bat species were considered to have the potential to occur within the PEL:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bentwing Bat (*Miniopterus australis*);
- Eastern Cave Bat (*Vespadelus troughtoni*);
- Golden-tipped Bat (*Kerivoula papuensis*);
- Eastern Freetail Bat (*Mormopterus norfolkensis*);
- Southern Myotis (*Myotis macropus*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 m, generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings (DEC 2005i).

The Little Bentwing Bat forms maternity colonies in spring with males and juveniles dispersing in summer. The species is generally found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and Banksia scrub, in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats (DEC 2005j).

The Eastern Cave Bat is a cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs and has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. It is occasionally found along cliff-lines in wet eucalypt forest and rainforest (DEC 2005k).

The Golden-tipped Bat is usually found in rainforest and adjacent wet and dry sclerophyll forest up to 1,000 m. It has also been recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. Roosts are mainly in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests, but also in tree hollows, dense foliage and epiphytes (DEC 2005l).

The Eastern Freetail Bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species roosts mainly in tree hollows but will also roost under bark or in man-made structures (DEC 2005m).

The Southern Myotis generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. The species forages over streams and pools catching insects and small fish by raking their feet across the water surface (DEC 2005n).

The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. The species usually roosts in tree hollows, but has also been found in buildings. Little is known of its reproductive cycle, however a single young is born in January. Prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (DEC 2005o).

Potential impacts to threatened bat species as a result of the proposed works include the disturbance of foraging areas and sheltering areas, including woody ground debris. To reduce potential impacts the following mitigation measures will be implemented as part of the proposed works (refer to Section 2.2):

- pre-clearance surveys to identify hollow-bearing trees;
- implementation of 'no work' buffer zones around identified habitat trees; and
- hand relocation of woody ground debris.

*The following factors must be taken into account in making a determination under this section:*

*a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Potential impacts to the life cycle of microbats include direct disturbance to breeding areas such as maternity caves, hollow-bearing trees, and maternity roosts. Habitats with the potential to be impacted within the PEL include sheltering sites in the form of woody ground debris and hollow-bearing trees. No caves will be impacted by the proposed works.

Mitigation measures to be implemented as part of the proposed works (refer to Section 2.2) include a pre-clearance survey with an experienced ecologist to identify potential microbat habitats within proposed seismic survey routes, which will then be avoided and provided with a minimum 10 m 'no work' buffer.

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the action proposed is unlikely to have an adverse effect on the life cycle of any viable local population of threatened microbat, such that it would be placed at risk of extinction.

*b) in the case of an endangered population, whether the action proposed is likely to have an adverse affect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No endangered populations of microbat occur within the locality.

*c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

> *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
>
> *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Not applicable to species.

*d) in relation to the habitat of a threatened species, population or ecological community:*

*(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,*

Where the proposed survey routes are not within formed tracks or other cleared areas, the proposal could result in the slashing of grasses and shrubs up to a maximum width of 3.7 m. Woody ground debris will be relocated by hand. Hollow-bearing trees will be identified and provided within a minimum 10 m 'no work' buffer. No other potential microbat habitats are to be impacted by the proposed works.

*(ii) whether an area of habitats is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The proposed works will not isolate or fragment known habitat for these mobile species.

*(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The PEL occurs within a relatively cleared corridor between two large vegetated areas to the east and the west. It is therefore likely that the habitats within the PEL provide foraging and sheltering habitat for microbats known from the locality. However, given the availability of similar resources within the locality and within the greater region, the habitat within the PEL would not be considered important to the long-term survival of any threatened microbat within the locality.

*e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)*

No areas of critical habitat have been listed for threatened bats within the locality.

*f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

Protection of roost sites is the major applicable recovery objective for threatened microbats. Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the action proposed is considered to be consistent with the recovery of threatened microbat species.

*g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process*

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), it is considered unlikely that the action will result in or increase the impact of any key threatening processes. Applicable mitigation and management measures include:

- no removal of woody debris;
- no impacts to significant areas of native vegetation;
- protection of hollow-bearing trees; and
- no tree removal.

#### i Conclusion

The proposed activity may result in minor, temporary impacts to the potential sheltering or foraging habitat for threatened bats within the locality. There is also the potential for disturbance to potential habitat from indirect impacts such as machinery and work crews. However, given the management and mitigation measures to be implemented as part of the proposed works (refer to Section 2.2), impacts are expected to be minor and will not result in an adverse effect such that any of the species would be placed at risk of extinction. A Species Impact Statement is not required.

### 3.1.4 Common Planigale

The Common Planigale is a small carnivorous marsupial that inhabits rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, usually close to water. They are active at night and shelter during the day in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. They breed from October to January (DEC 2005p).

Potential impacts to the Common Planigale include the disturbance of foraging areas and sheltering areas in the form of woody ground debris and grass tussocks. To reduce potential impacts the following mitigation measures will be implemented as part of the proposed works (refer to Section 2.2):

- pre-clearance survey by an experienced ecologist;
- hand relocation of woody ground debris; and
- where Planigales are identified within woody debris, the area will be avoided and a buffer implemented.

*The following factors must be taken into account in making a determination under this section:*

*a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Potential impacts to the life cycle of the Common Planigale include disturbance of nest sites and breeding individuals. Breeding can occur all year so if individuals are recorded during pre-clearance surveys, the area will be avoided. Habitats with the potential to be impacted include woody ground debris and dense grass tussocks. Ground debris will be relocated by hand to areas outside of the direct impact zone and any identified habitat will be avoided.

Given the management and mitigation measures to be implemented as part of the proposed works (refer to Section 2.2), the survey is not expected to have an adverse effect on the life cycle of the Common Planigale such that a viable local population would be placed at risk of extinction.

*b) in the case of an endangered population, whether the action proposed is likely to have an adverse affect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No endangered populations of Common Planigale occur within the locality.

*c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

*(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

*(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

Not applicable to species.

*d) in relation to the habitat of a threatened species, population or ecological community:*

*(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,*

Where the proposed survey routes are not within formed tracks or other cleared areas, the proposal could result in the slashing of grasses and shrubs up to a maximum width of 3.7 m. Woody ground debris will be relocated by hand. No other habitats are to be impacted by the proposed works.

*(ii) whether an area of habitats is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The proposed works will not isolate or fragment or modify known habitat for the Common Planigale. Habitats with the potential to be impacted include woody ground debris and dense grass tussocks. Slashing of grasses and shrubs would occur to a maximum width of 3.7 m. This would not result in the fragmentation of habitat for the Common Planigale.

*(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Given the restricted distribution and mobility of the species, if habitat were to occur within the PEL, it would be considered important to the species survival within the locality.

*e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)*

No areas of critical habitat have been listed for the Common Planigale within the locality.

*f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

Applicable recovery objectives for the Common Planigale include:

- protection of habitat (if recorded) from the proposed works; and
- retention of ground cover.

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), the actions proposed are considered to be consistent with the recovery of the Common Planigale.

*g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process*

Given the mitigation and management measures to be implemented as part of the proposed works (refer to Section 2.2), it is considered unlikely that the action will result in or increase the impact of any key threatening processes. Applicable mitigation and management measures include:

- no removal of woody debris; and
- no impacts to significant areas of native vegetation.

#### i Conclusion

The proposed activity may result in minor, temporary impacts to the potential habitat of the Common Planigale within the locality. There is also the potential for disturbance to potential habitat from indirect impacts such as machinery and work crews. However, given the management and mitigation measures to be implemented as part of the proposed works (refer to Section 2.2), impacts are expected to be minor and will not result in an adverse effect such that the species would be placed at risk of extinction. A Species Impact Statement is not required.

## 3.2 Flora

Flora species that would be most susceptible to impacts associated with the proposed works include small ground herbs, vines, small shrubs and orchids. These species can be easily overlooked and could be impacted by slashing and trampling. However, pre-clearance surveys will be conducted by an experienced ecologist to ensure that no threatened flora species occur within proposed survey routes or work zones. If threatened species are encountered, they will be flagged and avoided. Flora species to be targeted during pre-clearance surveys include:

- *Tetratheca juncea* (Black-eyed Susan);
- *Parsonsia dorrigoensis* (Milky Silkpod);
- *Senna acclinis* (Rainforest Cassia);
- *Asperula asthenes* (Trailing Woodruff); and
- *Pomaderris queenslandica* (Scant Pomaderris).

Given that pre-clearing surveys for threatened flora species will be conducted within the proposed survey routes, there is minimal potential for impact and consequently there is no requirement for assessments of significance.

# 4 Conclusion

This impact assessment found that significant impacts to threatened species with potential to occur within the locality would be unlikely, provided the recommended mitigation measures were implemented as part of the proposed works (refer to Section 2.2).

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