

Camden Gas Project

Spring Farm and Menangle Park

**Environmental Assessment – Spring Farm and
Menangle Park Gas Gathering System Modifications****Action statement**

Date	Name	Position	Action required <i>(Review/Endorse/Approve)</i>	Due date

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1. INTRODUCTION

1.1 Background

The Camden Gas Project (CGP) is a major coal seam methane (CSM) project involving the extraction of CSM gas located within the Southern Coalfield of the Sydney Basin. It is within Petroleum Exploration License 2 (PEL 2) which extends from Newcastle to Wollongong. The CGP currently consists of 123 wells, low pressure gas gathering lines, access roads, the Rosalind Park Gas Plant (RPGP) and a high pressure gas sales pipeline. The Petroleum Production Leases (PPLs) and planning approvals for the CGP have been issued individually from 2002, following initial gas production under Petroleum Assessment Lease 1 (PAL1) issued in November 2000 which became PPL1. Petroleum Exploration Licence (PEL) 2 surrounds the PPL areas, with the ongoing exploration for the future of the project being conducted within the PPLs and PEL 2.

AGL Gas Production (Camden) Pty Limited (AGL) currently operates four PPLs (PPL 1, 2, 4 and 5) in New South Wales (NSW). As the production operator for PPL4, AGL is responsible for the carrying out of the CGP and is the Proponent for these modifications.

This Environmental Assessment (EA) has been prepared to assess an application for three (3) modifications to the Project Approval 06_0291 for Spring Farm and Menangle Park Project Areas and an application for a modification to the existing Sugarloaf development consent (DA 75-4-2005) for the gas gathering line connection between SL02 and MP22.

AGL proposes to construct gas gathering systems between well surface locations within the Menangle Park and Sugarloaf well fields. The locations of the proposed gas gathering systems are shown in **Figure 1** and listed below:

- Modification 1 - Between MP03 and MP05;
- Modification 2 - Between MP06 and MP11; and
- Modification 3 – Between MP22 and SL02 (which includes modification to DA 75-4-2005).

The proposed routes of these gas gathering lines are outside the approved gas gathering routes described in the original EA and Project Approval for the Spring Farm and Menangle Park Project Areas, approved in 2008.

1.1.1 Existing Project Approval – Spring Farm and Menangle Park Project Areas - 06_0291

The NSW Minister for Planning approved the Project Application in accordance with section 75J of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). The conditions of the Project Approval (PA 06_0291, dated 4 September 2008) relate to the Spring Farm and Menangle Park Project Areas.

The existing Project Approval allows for the development of four (4) well surface locations in Spring Farm and 12 well surface locations in Menangle Park as well as the associated infrastructure such as the gas gathering system. The Approval also allows for the construction of the gas gathering system within a designated corridor of 25m either side of the proposed routes outlined in the EA.

1.1.2 Existing Development Consent – Sugarloaf – DA 75-4-2005

The proposed Modification 3 includes a link from MP22 to the existing well surface location SL02 within the Sugarloaf well field. This well field, including SL02, is subject to DA 75-4-2005 which was approved by the NSW Minister for Planning. The consent allows for the development of 9 wells, associated infrastructure such as the gas gathering system and connection to the RPPG. Should the Minister approve Modification 3 to PA 06_0291, then modification to DA 75-4-2005 is required to enable the connection of the gas gathering system.

1.2 Approvals Framework

Section 75W of the EP&A Act provides for the modification of an approval for a Project granted under Part 3A. Section 75W(2) allows a proponent to request the NSW Minister for Planning's approval to modify an existing Project Approval. If the modification is considered 'consistent' with the existing approval the Minister's approval is not required. However, if the modification is deemed to be 'inconsistent' with the Project Approval then the Minister's approval is required.

AGL consider that the three (3) proposed modifications for Project Approval (PA 06_0291) are 'inconsistent' with the existing Project Approval, as the proposed routes are outside the designated environmental envelopes. Consequently, the NSW Minister for Planning's approval is required for the modifications.

As stated above, should Modification 3 be approved by the Minister, then DA 75-4-205 would be modified to enable the connection of the gas gathering line between M22 and SL02. This EA addresses the modification of both PA 06_0291 and DA 75-4-2005.

1.3.1 Modification 1 - Proposed Modification between MP03 and MP05

As part of the existing Project Approval (PA 06_0291), the construction and operation of a gas gathering network between MP03 and MP05 was originally proposed to be located on the southern side of the Southern Railway Line. Following Project Approval in September 2008, detailed engineering design of the gas gathering system was undertaken and it identified a number of engineering constraints within the existing approved envelope between MP03 and MP05. As a result of this design work, a more desirable alternative gas gathering route has been identified.

The proposed modification to the existing Project Approval (PA 06_291) is for the construction and operation of a gas gathering network (via pipes up to 450mm diameter) between MP03 and MP05 located on the northern side of the Southern Railway Line, adjacent to Mount Annan Botanical Gardens. This is shown in **Figure 2**.

Whilst the construction and operation of the gas gathering system between MP03 and MP05 is part of the approved Project and the well surface locations have each been surveyed, the proposed route along the northern side of the Southern Railway Line is located outside the approved 50m corridor outlined in the original EA (HLA ENSR, 2007). As a result, AGL considers that the proposed modification (as described in Section 2) would alter the Project so as to be 'inconsistent' with the existing Project Approval.

Pursuant to section 75W(2) of the EP&A Act, AGL is seeking the NSW Minister for Planning's approval for the modification of the Approval to permit the proposed modification. Specifically, to Schedule 2 Condition 2 to incorporate this modification application and supporting report.

- Schedule 2, Condition 2 states:
 - *'The Proponent shall carry out the Project generally in accordance with the:*
 - (a) *The Project Application 06_0291;*
 - (b) *EA titled "Environmental Assessment – Expansion of Stage 2 Camden Gas Project Stage 2 Concept Area Spring Farm Project Area Menangle Park Project Area", Volume 1 and 2 prepared by ENSR Australia Pty Limited, and dated September 2007;*
 - (c) *Submissions Report prepared by ENSR Australia Pty Limited, and dated December 2007;*
 - (d) *Statement of Commitments; and*
 - (e) *Conditions of this approval.'*

The amendment sought is:

- (f) *EA titled 'Environmental Assessment – Spring Farm and Menangle Park Gas Gathering System Modifications', prepared by AGL Gas Production (Camden) Pty Ltd, dated November 2009.*

1.3.2 Modification 2 – Proposed Modification between MP06 and MP11

As part of the original EA prepared for the Spring Farm and Menangle Park Project Areas, an allowance was made for the connection of gas gathering systems between MP06 and MP11, as shown in **Figure 3**. The approved link between MP06 and MP11 crosses the Southern Railway Line, despite the underboring of the Southern Railway Line not being provided for within the EA or the Project Approval. This EA outlines the proposed underbore of the Southern Railway Line for the connection of MP06 and MP11.

The current gas gathering system between MP06 and MP11 will be replaced with a larger 450mm diameter pipe (or twinned with a similar sized 200mm pipe) and these replacement works will take place within the existing approved 50m corridor as stated in the original EA (HLA ENSR, 2007). The works are considered to be maintenance works and not subject to the modification process, although these works will be undertaken simultaneously with the underboring of the Southern Railway Line.

AGL considers that the proposed modification ('the underboring' as described in Section 2) would alter the Project so as to be 'inconsistent' with the existing Project Approval.

The proposed modification to Project Approval (PA 06_0291) requests a modification to Schedule 2 Condition 2 to incorporate the modification and supporting report.

- Schedule 2, Condition 2 states:
 - *'The Proponent shall carry out the Project generally in accordance with the:*
 - (a) *The Project Application 06_0291;*

- (b) EA titled “Environmental Assessment – Expansion of Stage 2 Camden Gas Project Stage 2 Concept Area Spring Farm Project Area Menangle Park Project Area”, Volume 1 and 2 prepared by ENSR Australia Pty Limited, and dated September 2007;
- (c) Submissions Report prepared by ENSR Australia Pty Limited, and dated December 2007;
- (d) Statement of Commitments; and
- (e) Conditions of this approval.’

The amendment sought is:

- (f) EA titled ‘Environmental Assessment – Spring Farm and Menangle Park Gas Gathering System Modifications’, prepared by AGL Gas Production (Camden) Pty Ltd, dated November 2009.

1.3.3 Modification 3 – Proposed Modification between MP22 and SL02

As part of the original EA prepared for the Spring Farm and Menangle Park Project Areas, an allowance was made for a gas gathering system link between the Menangle Park well field and the existing Sugarloaf well field. This link, via gas gathering lines, provides for the efficient transportation and distribution of gas extracted from the Sugarloaf well field and the Menangle Park well field to the Rosalind Park Gas Plant.

The link between the Menangle Park and the Sugarloaf well fields is proposed to occur between MP22 (Menangle Park) and SL02 (Sugarloaf). Detailed engineering design of the gas gathering system for the link has been undertaken and identified a proposed environmental envelope of 50m between MP22 and SL02 for a gas gathering system (via pipes up to 18 inch diameter). This is shown in **Figure 4**.

AGL considers that this proposed modification (as described in **Section 2**) would alter the Project so as to be ‘inconsistent’ with the existing Project Approval. Pursuant to section 75W(2) of the EP&A Act, AGL is seeking the NSW Minister for Planning’s approval for this modification of the Approval to permit the proposed modification.

The proposed modification to Project Approval (PA 06_0291) requests a modification to Schedule 2 Condition 2 to incorporate the modification and supporting report.

- Schedule 2, Condition 2 states:
 - ‘The Proponent shall carry out the Project generally in accordance with the:
 - (a) The Project Application 06_0291;
 - (b) EA titled “Environmental Assessment – Expansion of Stage 2 Camden Gas Project Stage 2 Concept Area Spring Farm Project Area Menangle Park Project Area”, Volume 1 and 2 prepared by ENSR Australia Pty Limited, and dated September 2007;
 - (c) Submissions Report prepared by ENSR Australia Pty Limited, and dated December 2007;
 - (d) Statement of Commitments; and

(e) Conditions of this approval.'

The amendment sought is:

(f) EA titled 'Environmental Assessment – Spring Farm and Menangle Park Gas Gathering System Modifications', prepared by AGL Gas Production (Camden) Pty Ltd, dated November 2009.

As previously stated, should Modification 3 be approved by the Minister, a modification is needed to the existing Sugarloaf development consent (DA 75-4-2005) to enable the gas gathering line connection from MP22 to SL02. It is proposed to use section 75W of the EP&A Act and this EA to modify this development consent. A separate application form to modify DA 75-4-2005 has been submitted with this EA.

1.3 Justification for Modifications

The proposed modifications involve the construction of gas gathering lines that provide links between MP03 and MP05 (Modification 1), between MP06 and MP11 (Modification 2) and between MP22 and SL02 (Modification 3). The gas gathering system links between well surface locations and well fields will enable to the transportation of gas to the RGP for treatment and distribution to market to satisfy the demand for gas in NSW.

Currently, the RGP remains the only gas treatment facility within the CGP where gas extracted from the existing wells is transported to and treated for subsequent distribution within the high pressure sales pipeline. There are sections within the CGP where the gas gathering system limits available capacity to accommodate future increases in the transportation of CSM gas to RGP. The proposed modifications would increase the capacity of some of the sections where current capacity is limited and enable efficient delivery of gas to the wider NSW market.

The construction works generally comprise the installation of 450mm diameter pipes within a designated environmental envelope which is consistent with the remainder of the gas gathering system for the CGP and connections between well surface locations via either trenching or underboring. The installation of a larger pipe within the gas gathering system is considered to be more efficient than constructing smaller pipes as this would require greater environmental disturbance and greater maintenance frequency than the construction of a single larger pipe.

The proposed modifications to the gas gathering systems are required to improve the efficiency of transportation of extracted CSM gas from wells within the CGP, which would be in the public interest.

The proposed locations of the modifications have been determined following detailed engineering studies subsequent to Project Approval. Locational principles were applied to the detailed design phase. These locational principles included utilising previously or currently disturbed land areas and existing access roads wherever possible. As a result, Modification 1 has been placed in the vicinity of an easement, which contains an Integral Energy overhead power line, and an existing access track, Modification 2 will be underboring the Southern Railway Line and Modification 3 will be underboring both the F5 and Menangle Road. All modifications would have minimal levels of disturbance and, in the case of the proposed route between MP03 and MP05, result in a smaller net disturbance footprint than the previously approved connections.



It is considered that the proposed modifications would be in the public interest and that the sites selected are suitable.

2. PROJECT DESCRIPTION

2.1 Overview

This EA outlines three (3) proposed modifications to the existing Project Approval (PA 06_0291) for the Spring Farm and Menangle Park Project Areas. These modifications include:

- Modification 1 - Proposed gas gathering system between MP03 and MP05 located on the northern side of the Southern Railway Line;
- Modification 2 - Proposed gas gathering system between MP06 and MP11; and
- Modification 3 - Proposed gas gathering system between MP22 and SL02.

The activities associated with these modifications are described in the following section. It is expected that the construction activities for the gas gathering systems of these modifications would be similar.

2.2 Proposed Activities for the Modifications

As described in the original EA (HLA ENSR, 2007) submitted with the Project Approval (PA 06_0291) for the Spring Farm and Menangle Park Project Areas, the gas gathering system route will be designed, constructed and operated in accordance with the requirements of *Australian Standard AS 4645.3 - 2008 Installation and Maintenance of Plastic Pipe Systems for Gas*. The gas gathering system will be buried to a minimum depth of 750mm and up to 1,200mm in some areas, including unsealed and sealed road crossings, and creek and drainage line crossings. The principal activities involved in the construction of the gas gathering system are as follows:

- Survey of pipeline route;
- Clear and grade 'Right of Way' pipeline route including stripping of any topsoil;
- Stringing of pipe;
- Welding of pipe joints;
- Trenching and underboring where necessary;
- Lowering-in of pipe strings (including trench preparation and padding);
- Installation of tracer lines (for pipe tracing) as polyethylene (PE) pipe is non conductive;
- Installation of gas marker tape above PE gas pipe;
- Backfilling and compaction of trench;
- Pressure testing of pipeline;
- Rehabilitation of ground along pipeline route;
- Installation of gas line signposts to mark and identify pipeline location; and
- Register gas gathering line on 'Dial before you dig'.

All work would be conducted in accordance with AGL's Environmental Management System (EMS) for the CGP. An ancillary water transfer system (i.e. water pipes), if required, would be co-located in the trenches for the gas gathering system and installed simultaneously.

Where the gas gathering line will be implemented via an underbore of the Southern Railway and roads, including the F5, it will involve the use of an underbore machine which is the size of a small truck. The use of underboring is common practice to lay pipes under existing roadways, driveways and some watercourses in order to minimise above ground disturbance to these items of infrastructure and the environment. The expected area of disturbance for the proposed gas gathering system would be approximately five (5) metres by five (5) metres wide at the underbore location which is located within the previously designated and approved corridor.

The underbore machine directionally drills a connection between the two locations to enable the installation of the 450mm pipe for the proposed gas gathering line. Generally, the depth of the underboring activities will be in order of 2 to 3 metres below the surface of the road. The process also involves the use of water to be fed through the auger to facilitate the drilling process. This water is captured by pumping into a tanker so that neither the water nor its suspended matter is discharged into the surrounding ground or drains.

The gas gathering route would be inspected annually by a specialist third party gas detection inspection service that performs a leakage survey of the below ground pipelines. The survey is conducted at 10 parts per million (ppm) sensitivity for gases and the 10ppm sensitivity reflects the measurement capability of the equipment used to check for leaks. It does not arise from an Australian Standard or any requirement. It represents AGL best practice which has been adopted from the practices used by high pressure gas pipeliners to inspect for gas leaks once a year (AGL only operates low pressure gas gathering lines at the CGP and consequently, this is a very high standard).

At the end of the network's operational life, the preferred method of closure and rehabilitation for the gas gathering system would be to purge with air or water to remove remaining gas, seal and then leave in position to prevent any further disturbance. This method would be subject to consultation with the affected landowners, such as Mount Annan Botanical Gardens for Modification 1, and also the RTA and the SCA for the gas gathering line beneath the F5 and Upper Canal respectively. Should removal of the gas gathering system be required, the excavated trench would be backfilled and rehabilitated, including contouring and revegetating.

The above described activities are also applicable to 'twinning' of the gas gathering system. Twinning is a process whereby similar gas gathering pipes are laid adjacent to the existing gas gathering pipes to allow for additional gas distribution capacity.

2.2.1 Construction Timeframes

The proposed construction activities for the three described modifications are anticipated to be completed within a maximum of five (5) weeks. The construction hours will be as per the existing Project Approval, which states 7am – 6pm Monday – Friday, and 8am – 1pm Saturdays.

2.3 Modification 1 - Proposed Modification between MP03 and MP05

2.3.1 Site Description

The proposed modification involves the construction and operation of a gas gathering system between MP03 and MP05 (see **Figure 2**). As shown in **Figure 2**, the proposed gas gathering system has an environmental envelope of 25m either side of the designated route.

The proposed route of the gas gathering system is located on land north of the Southern Railway Line and owned by Mount Annan Botanical Gardens. A transmission line traverses the Mount Annan Botanical Gardens and there is an existing unsealed access track used by maintenance vehicles associated with the transmission line. An existing fenced easement owned by Railcorp is located adjacent to the Southern Railway Line. The existing easement is located between the Southern Railway Line and the maintenance access track and currently contains a newly constructed overhead power line owned by Integral Energy. As part of the construction programme for this overhead power line, Integral Energy has some clearing of vegetation to complete as part of the provision of adequate clearance zones within the easement.

It is proposed that the gas gathering line be located within this existing fenced easement, where possible, and utilise the areas that have been previously cleared or will be cleared as part of the overhead power line development by Integral Energy.

The Southern Railway Line, F5 and the Upper Canal (owned by Sydney Catchment Authority) are key items of infrastructure along the proposed gas gathering system route. It is proposed that the railway line, the F5 and the Upper Canal be underbored to enable the gas gathering system to connect MP03 and MP05. The details of these crossings will be determined during the detailed engineering and design phase of the project in consultation with the relevant authorities.

MP05 is a well surface location that has already been constructed as per Project Approval (PA 06_0291). It is located on a small parcel of land, triangular in shape, and bounded by railway lines on each side. The vegetation on the site is highly degraded as it has been cleared, levelled and filled. Very little vegetation exists and, that which does, comprises weed species such as African Olive (HLA ENSR, 2007).

MP03 is located on the eastern side of the F5 and north of the railway line. Much of the site has been previously cleared and the remnant vegetation is disrupted by the presence of an existing access road and the underground high pressure gas pipeline and its associated right of way. The site contains some scattered Acacia species although, African Olive dominates the shrub layer of the site.

There are a number of residences in the vicinity of MP03, MP05 and the proposed gas gathering system corridor, with the nearest being approximately 200m from MP03. The proposed gas gathering system route does not encroach upon residences assessed in the previous EA.

2.3.2 Environmental Effects

The expected area of disturbance for the proposed gas gathering system would be approximately five (5) metres wide along the proposed route (within the designated corridor) and up to a depth of 1,200mm (dependent upon localised conditions).

The construction and operation of the gas gathering network between MP03 and MP05 would have the following primary environmental effects:

- Stripping of topsoil and grading along the gas gathering route could impact upon Aboriginal heritage;
- Stripping of topsoil and grading along the gas gathering route could impact upon soil and weathered materials could cause erosion; and
- Clearing of existing trees along the route could impact upon the ecology of the area.

The environmental effects of the proposed modification are discussed in **Section 5** of this report.

2.4 Modification 2 – Proposed Modification between MP06 and MP11

2.4.1 Site Description

The proposed modification involves the underboring of the Southern Railway Line for the gas gathering system between MP06 and MP11 (see **Figure 4**). The gas gathering system corridor runs in a northeast-southwest direction adjacent to the Southern Railway Line and located along an established gravel and dirt road. The area has been cleared and remaining vegetation comprises groundcover with some scattered African Olive. The underboring locations are located approximately 300m southwest of MP06 and approximately 80m northeast of MP11.

The proposed underboring locations of the gas gathering system are situated within the approved environmental envelope of the gas gathering lines, as stated in the original EA (HLA ENSR, 2007). This land is currently used for agricultural purposes, such as grazing.

The Southern Railway Line transects the gas gathering system between MP06 and MP11 and it is proposed that the Southern Railway Line be underbored to connect these well surface locations. The details of this crossing will be determined during the detailed engineering and design phase of the project in consultation with the relevant authorities.

A number of residences are located in the vicinity of the proposed underboring activities, with the nearest residence approximately 300m to the northeast. The proposed underboring activities for the gas gathering system route does not encroach on residences assessed in the previous EA.

2.4.2 Environmental Effects

The expected area of disturbance for the proposed gas gathering system would be approximately five (5) metres by five (5) metres wide at the underbore location which is located within the previously designated and approved corridor.

The construction and operation of the gas gathering network between MP06 and MP11 would have the following primary environmental effects:

- Stripping of topsoil and grading along the gas gathering route could impact upon Aboriginal heritage; and
- Stripping of topsoil and grading along the gas gathering route could impact upon soils and weathered materials and cause erosion.

The environmental effects of the proposed modification are discussed in **Section 5** of this report.

2.5 Modification 3 - Proposed Modification between MP22 and SL02

2.5.1 Site Description

The proposed modification involves the construction and operation of a gas gathering system between MP22 and SL02 (see **Figure 3**). As shown in **Figure 3**, the proposed gas gathering system has an environmental envelope of 25m either side of the designated route.

The proposed route of the gas gathering system is located on land currently used for agricultural purposes, such as grazing.

The F5 and Menangle Road are key items of infrastructure located within the proposed route for the gas gathering system. It is proposed that the F5 and Menangle Road be underbored to enable the gas gathering system to connect MP22 and SL02 and link the Menangle Park well field and the Sugarloaf well field. The gas gathering system will underbore both the F5 and Menangle Road in order to minimise potential land disturbance. The underbore will surface within the 25m by 25m footprint of the existing SL02 well surface location.

The environmental envelope for MP22 contains some vegetation, mostly Grey Box and Swamp Oak, with some presence of Cumberland Plain Woodland (HLA ENSR, 2007). The EA recommended that the well surface location and gas gathering system avoid clearing of native vegetation, particularly remnant trees, Eldersie Banksia Scrub and Cumberland Plain Woodland as well as to clearly identify or fence off significant habitat trees and Endangered Ecological Communities (EEC).

SL02 is an established well surface location and is located within the Sugarloaf well field. The well surface location was constructed in an area that had been previously modified and heavily degraded by grazing activities.

There are existing residences in the vicinity of MP22, SL02 and the proposed gas gathering system corridor, with the nearest residence being approximately 360m from MP22. The proposed gas gathering system route does not encroach on any residences assessed in the previous EA.

2.5.2 Environmental Effects

The expected area of disturbance for the proposed gas gathering system would be approximately five (5) metres by five (5) metres wide at the underbore location which is located within the previously designated and approved corridor.

The construction and operation of the gas gathering network between MP22 and SL02 would have the following primary environmental effects:

- Stripping of topsoil and grading along the gas gathering route could impact upon Aboriginal heritage; and
- Stripping of topsoil and grading along the gas gathering route could affect soils and weathered materials and cause erosion.

The environmental effects of the proposed modification are discussed in **Section 5** of this report.

2.6 Employment and Public Benefit

The construction of the proposed gas gathering lines between MP03 and MP05, between MP06 and MP11 and between MP22 and SL02 will contribute to the development of the CGP. As stated in the Project Approval (PA 06_0291), the development of Spring Farm and Menangle Park Project Areas is expected to generate 35 jobs during construction and three (3) jobs during operation.

The proposed modification would also allow for the efficient distribution of gas from well surface locations from the northern sections of the CGP (such as Menangle Park Project Area and the future Camden North well field). The gas would be transported to the RPGP for treatment and distribution via the high pressure sales pipeline.

The successful distribution of the gas produced from the wells within the CGP will enable the supply of gas to the wider NSW market (CGP currently supplies up to 6% of NSW gas).

3. STATUTORY FRAMEWORK

3.1 Local Planning Matters

The proposed modification will be undertaken on land within the Campbelltown Local Government Area (LGA). Environmental planning instruments relevant to the proposed modifications are:

- *Campbelltown (Urban Area) Local Environmental Plan 2002;*
- *Interim Development Order No.15 – City of Campbelltown;* and
- *Campbelltown Local Environmental Plan – District 8 (Central Hills Land).*

The relevant zoning for the land associated with the proposed modifications is shown in the table below.

Table 1: Local Environmental Planning Instruments and Zoning

Modification	Component	Environmental Planning Instrument	Zoning
<i>MP03 to MP05</i>	MP03	Campbelltown (Urban Area) LOP 2002	10(a) Regional Comprehensive Centre
	MP05	Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (40ha)
	Gas Gathering System	Campbelltown (Urban Area) LEP 2002	10(a) Regional Comprehensive Centre
		Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (40ha)
		Campbelltown Local Environmental Plan – District 8 (Central Hills Land)	5(g) Special Uses (Botanical Gardens)
<i>MP06 to MP11</i>	Gas Gathering System	Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (40ha)
<i>MP22 to SL02</i>	MP22	Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (40ha)
	SL02	Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (100ha)
	Gas Gathering System	Interim Development Order No.15 – City of Campbelltown	1 Non-Urban (40ha)
			1 Non-Urban (100ha)

3.1.1 Definition of the Development

Interim Development Order No.15 – City of Campbelltown

As shown in **Table 1**, Interim Development Order No.15 – City of Campbelltown (IDO 15) applies to MP05 and the connection to the proposed gas gathering system from MP03. IDO 15 also applies to MP22 and the gas gathering system connection between MP06 and MP11, as well as the underboring between MP22 and SL02.

Clause 3 of the IDO 15 adopts the *Environmental Planning and Assessment (Model Provisions) 1980* (Model Provisions) for the purposes of the order. Under the Model Provisions, the proposed modification fits into the definition of a ‘public utility undertaking’, that is:

‘any of the following undertakings carried on or permitted or suffered to be carried on by or by authority of any Government Department or under the authority of or in pursuance of any Commonwealth or State Act:

(a) railway, road transport, water transport, air transport, wharf or river undertakings,

(b) undertakings for the supply of water, hydraulic power, electricity or gas or the provision of sewerage or drainage services, and a reference to a person carrying on a public utility undertaking shall be construed as including a reference to a council, county council, Government Department, corporation, firm or authority carrying on the undertaking.’

It is also relevant to note that as the proposal is for works to be carried out for the primary purpose of the supply of gas, authorised under the *NSW Petroleum (Onshore) Act 1991* (see ‘in pursuance of any ... State Act’ in definition of public utility undertaking above). Thus, it satisfies this aspect of the definition.

Additionally, under the Model Provisions a ‘utility installation’ is defined as:

‘a building or work used by a public utility undertaking, but does not include a building designed wholly or principally as administrative or business premises or as a showroom’.

As the proposed development is defined as a ‘public utility undertaking’ and the definition of a utility installation involves ‘a building or work used by a public utility undertaking’, it is considered that the proposed development may also be defined as a ‘utility installation’ under the Model Provisions.

Therefore, the activities for the proposed modifications are defined as either a ‘public utility undertaking’ or as a ‘utility installation’. The relevant zones within IDO 15 are 1 – Non Urban (40ha) and 1 – Non Urban (100ha). Within these zones, public utility undertakings and utility installations are permissible with consent as provided by clause 4 of the IDO 15.

Campbelltown (Urban Area) Local Environmental Plan 2002 (LEP 2002)

As demonstrated in the EA (HLA ENSR, 2007), Schedule 3 of LEP 2002 provides a range of definitions including that of a ‘public utility undertaking’, which is the same as the definition provided in the Model Provisions.

Additionally, under Schedule 3 of LEP 2002 a ‘utility installation’ is defined as in the Model Provisions.

As the proposed development is defined as a ‘public utility undertaking’ and the definition of a utility installation involves ‘a building or work used by a public utility undertaking’, it is therefore considered

that the proposed development may also be defined as a 'utility installation' under the provisions of LEP 2002.

The relevant zone to the proposed modifications (see **Table 1**) is 10(a) Regional Comprehensive Centre. Within this zone, utility installations are permissible without consent.

Campbelltown Local Environmental Plan – District 8 (Central Hills Lands)

The Central Hills LEP applies to the proposed route of the gas gathering system between MP03 and MP05.

Clause 6 of the Central Hills Lands LEP adopts of the Model Provisions. As previously discussed, it is considered that the proposed modifications can be defined as both a 'public utility undertaking' and 'utility installation' as per the definitions provided within the Model Provisions.

The relevant zone for the proposed modification is 5(g) Special Uses (Botanical Gardens). Whilst neither a 'utility installation' or a 'public utility undertaking' are permissible within this zone, clause 35(a) of the Model Provisions states that:

'Nothing in the local environmental plan shall be construed as restricting or prohibiting or enabling the consent authority to restrict or prohibit:

(a) the carrying out of development of any description specified in Schedule 1,

Schedule 1 of the Model Provisions states:

'The carrying out by persons carrying on public utility undertakings, being water, sewerage, drainage, electricity or gas undertakings, of any of the following development, being development required for the purpose of their undertakings, that is to say:

(a) development of any description at or below the surface of the ground,...'

Therefore, it is considered that the proposed modification satisfies clause 35(a) of the Model Provisions and the proposed modification within 5(g) Special Uses (Botanical Gardens) is permissible.

3.2 EP&A Act

As previously stated, the proposed modifications are subject to section 75W of the EP&A Act. Section 75W of the EP&A Act permits a proponent to modify an Approval. The requirement for an approval from the Minister for Planning is based on the following criteria:

- If the Project as modified would be consistent with the existing Approval then no approval of the modification is required; and
- If the Project as modified would be inconsistent with the existing Approval then approval of the modification is required from the Minister for Planning.

AGL considers that the proposed modifications (as set out in **Section 1.3**) would alter the existing Project Approval (06_0291) so as to be 'inconsistent'. As a result, AGL is seeking the Minister for Planning's approval for the modification of the Approval to permit the proposed modification, pursuant to section 75W(2) of the EP&A Act.

Section 75W(3) requires that the request for the Minister's approval is to be lodged with the Department of Planning (DoP). The Director General may notify the proponent of environmental assessment requirements with respect to the proposed modifications that the proponent must comply with before the proposed modification will be considered by the Minister. AGL has consulted with DoP with regard to the modifications and no formal environmental assessment requirements (EARs) have been issued. However, AGL has completed the assessment in accordance with matters identified by DoP in discussions about the proposed modifications.

3.3 Other State Planning Matters

The relevant State planning matters for the proposed modification include:

- *NSW Petroleum (Onshore) Act 1991*;
 - The activities associated with the proposed modifications are in accordance with the requirements of the PPL4. Namely, section 41 that states with respect to the rights of production lease holders;
 - *'The holder of a production lease has the exclusive right to conduct petroleum mining operations in and on the land included in the lease together with the right to construct and maintain on the land such works, buildings, plant, waterways, roads, pipelines, dams, reservoirs, tanks, pumping stations, tramways, railways, telephone lines, electric powerlines and other structures and equipment as are necessary for the full enjoyment of the lease or to fulfill the lessee's obligations.'*
- *NSW Threatened Species Conservation Act 1997 (TSC Act)*;
 - The activities associated with the proposed modifications do not impact upon threatened or endangered species listed in the TSC Act (see **Section 5.1**).

As stated in the EA (HLA ENSR, 2007), a number of State Environmental Planning Policies (SEPPs) apply to the Camden Gas Project, and the proposed modifications. These SEPPs include:

- *SEPP (Major Development) 2005*;
 - As stated in **Section 1.1.1**, the Minister declared the Spring Farm and Menangle Park Project Application as a 'Major Project' as the proposed development falls within the definition under Group 6 of Schedule 1 of the SEPP. The proposed modification is to amend the current Project Approval under Part 3A of the EP&A Act.
- *SEPP (Sydney Region Growth Centre) 2006*; and
 - As stated in the EA, the Growth Centre SEPP provides land use zones, objectives and land use tables which identify the permissibility of development and matters for consideration by the consent authority. The land use zones identify development for the purposes of 'public utility installations' as being permissible without consent.
- *SEPP (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)*.

- Clause 7(2) of the Mining SEPP identifies development which can be carried out with consent and includes the following of relevance to the proposed modifications:

‘Petroleum production development for any of the following purposes:

- (a) Petroleum production on land which development for the purposes of agriculture or industry may be carried out (with or without consent),
 - (b) Petroleum production on land that is, immediately before the commencement of this clause, the subject of a production lease under the NSW Petroleum (Onshore) Act 1991,
 - (c) Facilities for the processing or transportation of petroleum on land which petroleum production may be carried out (with or without development consent), but if the petroleum being processed or transported was recovered from that or adjoining land.
- The proposed modifications are considered to be consistent with the objectives of the Mining SEPP.

3.4 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) contains an assessment and approvals framework for actions that will have, or are likely to have, significant impact on matters of National Environmental Significance (NES).

Under the EPBC Act there are seven matters of NES. The proposed works associated with the modifications are not considered to create a significant impact upon these matters of NES under the EPBC Act. As such, the modification has not been referred to the Commonwealth Environment, Water, Heritage and the Arts Minister for assessment under the EPBC Act.

3.5 Existing Environmental Licences and Approvals

3.5.1 Environment Protection Licence

The existing CGP is subject to an Environment Protection Licence (EPL) (Licence No. 12003) for its operations under the *NSW Protection of the Environment Operations Act 1997* (PoEO Act). AGL currently reports annually to the NSW Department of Environment, Climate Change and Water (DECCW). It is proposed that the EPL (L12003) is updated to include the proposed modifications should approval be granted by the Minister.

4. CONSULTATION

AGL has consulted with the DoP regarding the proposed modifications to the CGP. As the proposed modifications are not expected to result in significant environmental impacts and the modifications are considered to be substantially the same development, DoP determined that EARs were not required. However, DoP outlined some environmental aspects to be addressed in the modification process. These aspects are listed below:

- Potential ecological impacts along the proposed gas gathering system as a result of clearing;
- Potential archaeological impacts along the proposed gas gathering system as a result of ground disturbance; and
- Potential erosion impacts as a result of the construction of the gas gathering system.

AGL has also consulted with the NSW Department of Investment and Industry (INI), formerly the Department of Primary Industries, regarding the proposed gas gathering lines.

Additionally, in accordance with the existing Project Approval (PA 06_0291), AGL will consult with landowners prior to the commencement of construction of the gas gathering system.

5. ENVIRONMENTAL IMPACT ASSESSMENT

5.1 Flora and Fauna

5.1.1 Introduction

The Flora and Fauna assessment focussed on the proposed gas gathering route between MP03 and MP05 (Modification 1), as the study areas for the other modifications (Modification 2 – between MP06 and MP11 and Modification 3 – between MP22 and SL02) have either previously been surveyed as part of the existing Project Approval (PA 06_0291) or are located in areas that are largely cleared.

This Flora and Fauna assessment for the gas gathering corridor between MP03 and MP05 included a site inspection aimed at identifying terrestrial ecological values of significance in accordance with Section 5A of the EP&A Act, TSC Act and the EPBC Act.

5.1.2 Methodology

The survey provided an assessment of the general condition of the corridor and of flora and fauna species and habitats present. Vegetation and fauna habitats were assessed as being in Good, Moderate or Poor condition or an unnatural landscape.

5.1.3 Results

Plant Communities

Towards the west of the study area near the Southern Railway Line, vegetation consisted of mainly exotic species, including *Digitaria sanguinalis*, *Chloris gayana*, *Verbena bonariensis*, *Eragrostis curvula* and *Senecio madagascariensis*. The shrub layer was sparse, and no canopy trees existed. Some regeneration of native vegetation was present heading east towards the Upper Canal. The regeneration is located within a fenced area (i.e. the easement containing the Integral Energy overhead power line), approximately 3m from the access track. The regeneration would most likely represent that of the nearby Cumberland Plain vegetation community.

Vegetation to the west near the Upper Canal was dominated by exotic species and to the east of the Upper Canal, the vegetation is in a Poor to Moderate condition in some sections. *Eucalyptus moluccana* and *Eucalyptus Tereticornis* were the dominant canopy species. The understorey was dominated by *Olea europaea* subsp. *europaea* and ground layer exotic species. Previous vegetation mapping undertaken by DECCW stated that this community corresponds with Shale Plains Woodland, with Shale Hills Woodland in close proximity. Both of these are components of Cumberland Plain Woodland (CPW). CPW is listed as an Endangered Ecological Community (EEC) in both the TSC Act and EPBC Act. This is supported by the presence of *Eucalyptus moluccana*, *Eucalyptus Tereticornis* and *Bursaria spinosa*.

Towards the east of the F5, flora consists mainly of exotic grasses such as *Digitaria sanguinalis*, *Eragrostis curvula*, *Lolium perene* and *Bromus mulliformis*.

Significant Plant Communities

Previous mapping undertaken for the study identified a vegetation community as CPW which is an EEC. The proposed gas gathering system corridor is located in close proximity to an existing access track and an existing utility easement and no mature trees will be removed. The construction of the gas gathering system may require the removal of a very small amount of juvenile trees, but it is understood that the majority of these juvenile trees are scheduled for removal as part of the completion of the construction of the Integral Energy overhead power line.

An Assessment of Significance under the TSC Act and the EPBC Act was prepared for the area of CPW potentially impacted by the gas gathering system and is attached to this report in **Appendix A** (Biosis Research, 2009). Due to the minimal clearing of native vegetation, and resulting minimal indirect impacts, these assessments found that the proposed gas gathering system is not likely to have a significant impact on CPW.

Nevertheless, it is recommended that the proposed gas gathering line be constructed south of the access track in this location, or to either side of the access track where no native trees will be removed.

Flora

A total of 37 plant species were recorded in the study area, comprising 17 (46%) local native species and 20 (54%) exotic species.

Significant Flora Species

None of the plant species recorded in the survey is listed as Threatened in the TSC Act or EPBC Act. However, a total of 28 threatened plant species have previously been recorded in the region as listed on databases of DECCW and DEWHA. Due to the proximity of the previous records and information gathered during field surveys within the study area, *Pimelea spicata* has potential to occur within the study area. On this basis, an Assessment of Significance under the TSC Act and the EPBC Act was prepared and is attached to this report (Biosis Research, 2009). The assessments concluded that the proposed gas gathering system is unlikely to have a significant impact on this species.

Fauna Habitat

The proposed gas gathering system corridor supports little native groundcover vegetation, with some leaf litter, debris or fallen logs. The exotic shrub layer and small tree layer would provide shelter and foraging habitat for a range of common birds and reptiles. Most of the trees within the impact area were all relatively young, with no tree hollows recorded.

Fauna Habitat Condition

The habitat features (shelter and foraging) within the proposed gas gathering corridor are considered to be in Poor condition and provide limited opportunities for native fauna, particularly rare and threatened species. Only habitat generalist avifauna (those adapted to in urban environments) is likely to occur within the corridor on any regular basis.

Significant Fauna

A total of 55 threatened fauna species have previously been recorded in the region as listed on databases of DECCW and DEWHA. Of these, there is potential habitat for 20 of these species. Potential habitat for the threatened and migratory species in the proposed gas gathering system corridor exists in a small area of foraging habitat only. These species are likely to only use the resources in the corridor on a temporary basis and are unlikely to be dependent on these resources given the availability of similar habitats in the vicinity of the corridor. However, as a precautionary approach, an Assessment of Significance under the TSC Act has been prepared for the Cumberland Land Snail, as the ecology of the species is not yet fully understood, and may use the limited leaf litter within the Cumberland Plain vegetation community east of the Upper Canal, as habitat. The assessment concluded that the proposed gas gathering system is unlikely to have a significant impact on this species.

5.1.4 Recommendations

Whilst the proposed gas gathering system is unlikely to have a significant impact on threatened species, endangered communities or populations, it is recommended that the following points be taken into consideration to minimise any disturbances on ecological values of the proposed gas gathering system corridor:

- Access to the sites should be via existing access tracks;
- Native trees should be avoided as far as is practicable. Some impacts to small trees of DBH less than 10 cm may be unavoidable, but trees greater than DBH of 10cm will be avoided;
- Appropriate erosion control measures should be employed when construction activities are occurring in the drainage lines. Erosion control measures should be employed and well maintained on steep slopes;
- The disturbed areas should be re-established at the completion of construction, involving the re-instatement of the soil and allowing the area to revegetate naturally;
- The area will be rehabilitated using seed bearing branches from nearby native species and native seed stock; and
- Noxious weed material cleared along the proposed route of the gas gathering system should be disposed of appropriately off site at a green waste facility to limit further spread.

5.2 Aboriginal Heritage

5.2.1 Introduction

The Aboriginal Heritage assessment focussed on the proposed gas gathering route between MP03 and MP05 (Modification 1), as the study areas for the other modifications (Modification 2 – between MP06 and MP11 and Modification 3 – between MP22 and SL02) have either previously been surveyed as part of the existing Project Approval (PA 06_0291) or are located in areas that have been previously disturbed.

The Aboriginal Heritage assessment included a site inspection of the proposed gas gathering line corridor between MP03 and MP05. The site inspection involved Aboriginal stakeholders that had previously been

involved in the original Archaeological Heritage Assessment (HLA ENSR, 2007) of the Menangle Park Project Area. These stakeholders included participants from the Tharawal Local Aboriginal Land Council (LALC) (Donna Whillock) and Cubbitch Barta Native Title Claimants Aboriginal Corporation (NTCAC) (Glenda Chalker). The assessment is provided in **Appendix B**.

5.2.2 Archaeological Context

The Nepean River hill slopes south of Camden have been subject to continuous archaeological study during the last 20 years. Most of this work has been undertaken for impact assessments and a small number of archaeological excavations.

There are three previous Aboriginal Heritage assessments or documents that are relevant to the proposed gas gathering corridor, with these reports being:

- Archaeological Heritage Assessment: Camden Gas Project Stage 2 – Spring Farm and Menangle Park Project Areas, Environmental Assessment, prepared by HLA ENSR (2007);
- Cultural Heritage Assessment: Mount Annan, NSW 66kV Overhead Lines, prepared by Navin Officer Heritage Consultants Pty Ltd (2008); and
- Camden Gas Project: Aboriginal Cultural Heritage Management Plan, prepared by Biosis Research (2008).

These assessments included identified artefacts and items in the vicinity of the proposed gas gathering corridor, with two previously identified items located within the proposed gas gathering line corridor. These two sites are:

- MA 2 (52-2-####); and
- Mount Annan, Macarthur Substation Site 1 (52-2-3316).

5.2.3 Archaeological Survey Methods and Results

A comprehensive ground surface inspection was conducted along the entire proposed gas gathering line corridor, which is approximately 1km long and 5m wide. Observations of archaeological exposure, ground surface visibility, extent and type of disturbance (if present), and landform element were made during the survey.

There were three (3) Aboriginal archaeological sites, including previously identified sites, recorded within the gas gathering line corridor between MP03 and MP05. MA 2 (52-2-####) was originally recorded as five (5) flake fragments, however, these fragments were not located in the survey. Instead, 3 previously unidentified fragments and a fragment of an historical bottle were located. These artefacts were moved off the road, to behind a fence that identified the previously registered artefacts.

Mount Annan, Macarthur Substation Site 1 (52-2-3316) was previously recorded as an isolated red silcrete artefact. However, this site was not located within the current survey.

In addition to the two (2) previously registered sites mentioned above, CG-IA-16 was recorded during the current survey, located south of MA 2. The site consists of a single isolated silcrete flake.

5.2.4 Recommendations

Due to the location of two (2) of the Aboriginal archaeological sites (MA 2 (52-2-####) and CG-IA-16) being within the proposed gas gathering system corridor, it is recommended that both artefact sites be collected and relocated prior to the construction of the gas gathering line, to avoid their disturbance.

The Tharawal LALC and Cubbitch Barta NTCAC have agreed with the above recommendation.

Additionally, as per the EMS for the CGP, it is recommended that the following be implemented:

- Both archaeological sites be preserved through relocation as redirecting the gas gathering line will result in impacts to previously undisturbed vegetation and cultural landscapes;
- All vehicles and work movements must stay in previously cleared and disturbed areas along the existing access track and cut drainage channel;
- All Aboriginal objects and places are protected under the *NSW National Parks and Wildlife Act 1974*. Should any Aboriginal relics be encountered during works associated with this proposal, works must cease in the vicinity of the find and the NSW Department of Environment, Climate Change and Water (DECCW) as well as Aboriginal stakeholders be notified. A qualified archaeologist may also be required to assess the find; and
- It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by DECCW.

It should be noted that all management strategies within the Aboriginal Cultural Heritage Management Plan, which is part of the CGP EMS, were formulated in consultation with the Tharawal LALC and Cubbitch Barta NTCAC.

5.3 Other Environmental Issues

The construction of the gas gathering systems for each of the proposed modifications will be undertaken in accordance with the AGL EMS. Within the EMS, there are a number of sub-plans (see **Section 6**) that address and manage particular environmental issues associated with the construction of gas gathering systems. These issues are addressed collectively for each of the three modifications in the following sections.

5.3.1 Noise

The construction of the gas gathering system will involve the use of a trenching machine, which is considered to be the noisiest machine in the construction process. As stated in Appendix F of the EA for Spring Farm and Menangle Park (HLA ENSR, 2007), the typical sound power level for the equipment used for excavation of trenches and pipe laying is 100 dBA. Usually, dependent of terrain, construction of the gas gathering system moves at a rate of up to 400m per day. Therefore, the noise is transient and short term, and will occur once during construction.

Typically, the noise criteria for this activity can be defined as the background level plus 20 dBA. The background level for each of the well surface location construction areas has been defined in previous studies. It can be summarised as follows:

Table 2: Construction Noise Criteria at well surface locations for gas gathering line modifications

Representative Locations	Rating Background Level (RBL)	Construction Criteria
	Weekday (7am to 6pm) and Saturday (7am to 1pm)	
MP03	44 dBA	64 dBA
MP05	35 dBA	55 dBA
MP11	37 dBA	57 dBA
MP22	44 dBA	64 dBA
SL03/09	34 dBA	54 dBA

Assessment

As stated in **Section 2**, there are no residences located within 200m of the three (3) proposed modifications, with distances ranging from between 200 and 360m. Table 2 demonstrates that the well surface locations associated with the proposed modifications have a measured daytime background noise levels of between approximately 35 and 44 dBA. The previous EA stated that the noise criterion for construction of gas gathering lines is unlikely to be exceeded unless the gas gathering system encroaches within 70m of a residence (HLA ENSR, 2007).

Therefore it is unlikely that the proposed modifications will cause a significant noise disturbance at any residential receiver.

5.3.2 Traffic

The proposed modifications are located in the vicinity of the F5 (Hume Highway), Glenlee Road (east) and Menangle Road. The F5 Freeway extends south of the M5 Motorway at the Cross Roads and is the principle route serving Macarthur and the Southern Highlands. The F5 is the primary link between Canberra and Sydney and forms part of the national highway network. Menangle Road is a sub-arterial road connecting the township of Menangle with the City of Campbelltown and is currently a sealed single-lane (each direction) road with travel speeds of up to 100 km/h. Glenlee Road (east) is an east-west road off Menangle Road passing over the freeway and forming an access point to Glenlee House. The suburb of Menangle Park is located to the west off Menangle Road and local roads include Cummins Road and Fitzpatrick Street.

The well surface locations and proposed gas gathering systems routes would be accessed via existing roads and access tracks. These access arrangements are listed below:

- MP03 is currently accessed by an existing access track located off Menangle Road;
- MP05 is currently accessed via Glenlee Road and an underpass under the Southern Railway Line;
- MP06 is currently accessed via an access track from MP05;
- MP11 is currently accessed via an access track from Fitzpatrick Street;

- MP22 is currently accessed via existing tracks from a private access road from Glenlee Road (east); and
- SL02 is currently accessed via an access track from Menangle Road.

Previous assessments undertaken for the Spring Farm and Menangle Park Project Application (06_0291) concluded that the existing traffic flow of Menangle Road is relatively low for a sub-arterial roadway, although road capacity envisages future growth in the area.

The construction of the gas gathering system requires the use of plant and equipment. Typically, the construction activities include the utilisation of an underbore machine, grader, excavator, water truck, two 4WDs, a vacuum vehicle and utility vehicle. During the construction activities machinery would be generally maintained on-site for the duration of the works resulting in only two heavy vehicle movement cycles (one for the machinery to come in and one to take the machinery out).

Assessment

The gas gathering system would extend from the individual well surface locations to interconnect with existing low pressure gas gathering system to transport the gas to the RGP. This would involve trenching adjacent to roadways which may result in temporary disruptions to traffic flows. These works would be undertaken out of peak traffic times and would be conducted under controlled traffic conditions minimising impacts to road users.

As previously stated, AGL currently utilises an EMS for the CGP, which has been approved by the Director General. Within the EMS, a Traffic Management Sub-Plan (Appendix K of the EMS) has been prepared and implemented. This plan was prepared to satisfy a requirement of the existing Project Approval (PA 06-0291), which stated:

'The Proponent shall prepare and implement a Construction Traffic Management Plan for the project in consultation with the RTA, Camden Council and Campbelltown City Council, and to the satisfaction of the Director-General. The plan shall be submitted to the Director-General prior to construction commencing (or otherwise agreed by the Director-General) and shall include:

(a) A description of the measures that would be implemented to:

Maintain access;

Minimise the potential noise and safety impacts associated with the construction of the gas gathering lines and construction traffic; and

(b) Traffic control plans, where appropriate.'

It is considered that the implementation of the existing EMS for the proposed modifications would minimise the potential traffic impacts associated with the construction of the gas gathering systems.

5.3.3 Erosion Control

The proposed modifications involve trenching and, potentially minor excavation works (e.g. underboring of infrastructure), for the construction of the gas gathering systems. Ground disturbance activities may potentially impact upon the soils and water through an increase in erosion.

The proposed modifications do not cross any watercourses. However, the proposed gas gathering system between MP03 and MP05 (Modification 1) crosses the Upper Canal. The Upper Canal, in the vicinity of the proposed gas gathering system crossing is encased within two 1,000mm steel pipes that are suspended via concrete columns approximately 8m above the ground, in order for the Upper Canal to cross the Southern Railway Line.

Assessment

The gas gathering system between MP03 and MP05 (Modification 1) would either be trenched or bored under the Upper Canal. It would be virtually impossible for sediment to enter the Upper Canal with these construction techniques.

As previously stated, AGL currently utilises an EMS for the CGP, which has been approved by the Director General. Within the EMS, a Soil and Water Management Sub-Plan (Appendix E of the EMS) has been prepared and implemented. This plan was prepared to satisfy requirements within the existing Project Approval (PA 06-0291). These requirements relate to the minimisation of soil erosion and the discharge of sediments and water pollutants, as well not adversely affecting the water quality of the Upper Canal.

Environmental management measures that would be implemented, as part of the EMS, for the construction of the gas gathering systems would include the following:

- Top soil would be stored separately to the underlying soils;
- The trench and excavated area of the underboring location would be backfilled as soon as practical using the excavated spoil;
- Stormwater caught in the trench may be used for dust suppression on adjacent areas; and
- Underboring sites would comprise suitably sized pits to capture underboring drill cutting and drilling water. The water would be pumped into a tanker to minimise ground infiltration and runoff to surrounding ground and drains.

It is considered that the implementation of the existing EMS for the proposed underboring and trenching within the three (3) modifications would minimise the potential soil and water impacts associated with the construction of the gas gathering systems.

6. CONCLUSION

AGL proposes to modify the existing Project Approval (PA 06_0291) for Spring Farm and Menangle Park with the construction of a gas gathering system between MP03 and MP05 (Modification 1), between MP06 and MP11 (Modification 2) and between MP22 and SL02 (Modification 3). This EA also addresses the need to modify DA 75-4-2005. The construction of these gas gathering systems is considered to be inconsistent with the existing Project Approval.

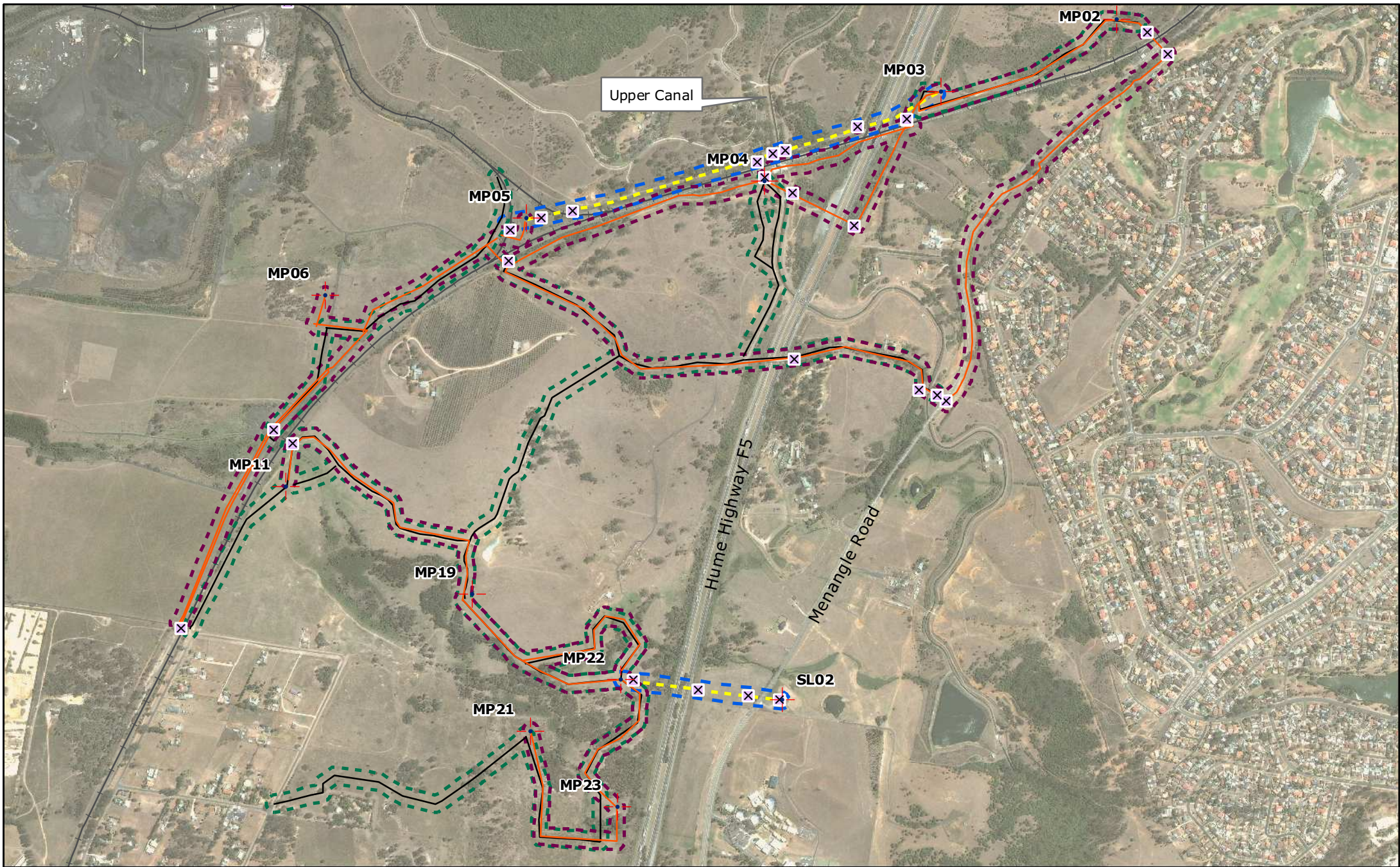
The proposed gas gathering systems are required to upgrade the capacity of the gas gathering network for the CGP in order to facilitate the transportation of gas extracted from well surface locations to the Rosalind Park Gas Plant for treatment and distribution to the Sydney gas market via the high pressure sales pipeline.

Ecological and archaeological surveys were undertaken for the areas to be disturbed by the proposed modifications that had not been previously surveyed. Mitigation measures, consistent with those contained within the existing EMS, would be implemented during the construction of the gas gathering system. The environmental assessment of the proposed gas gathering systems concluded that there would be minimal environmental impact on the residences and the environment as a result of the construction works and the project's operations.

To ensure this occurs, the existing EMS for the CGP would be updated to include the proposed gas gathering systems.



Figures



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Author: Upstream Gas

Date: 07/10/2009

Ref: 2156r1

Proposed Modifications for Camden Gas Project

Metres
0 250 500
Scale 1:14,000

Legend

Wells
Underbore

Gathering Pipelines

Access Road

Modification Gathering

Southern Railway Line

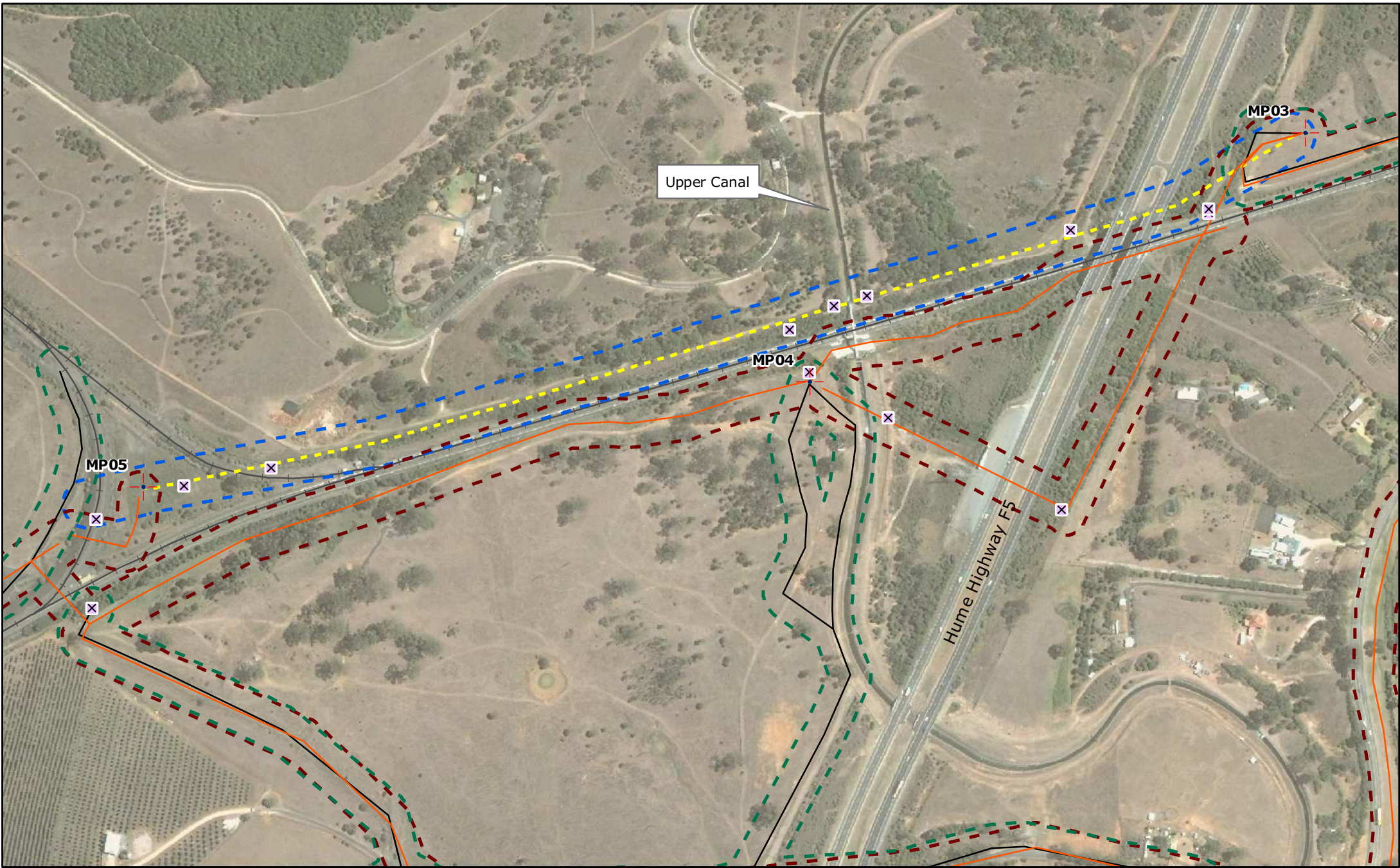
Existing 50m Corridor Gathering

Existing 50m Corridor Road Access

Proposed 50m Corridor Gathering

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Author: Upstream Gas

Date: 15/09/2009

Ref: 2158

**Proposed Gas Gathering System
between MP03 and MP05**

0 100 200
Metres

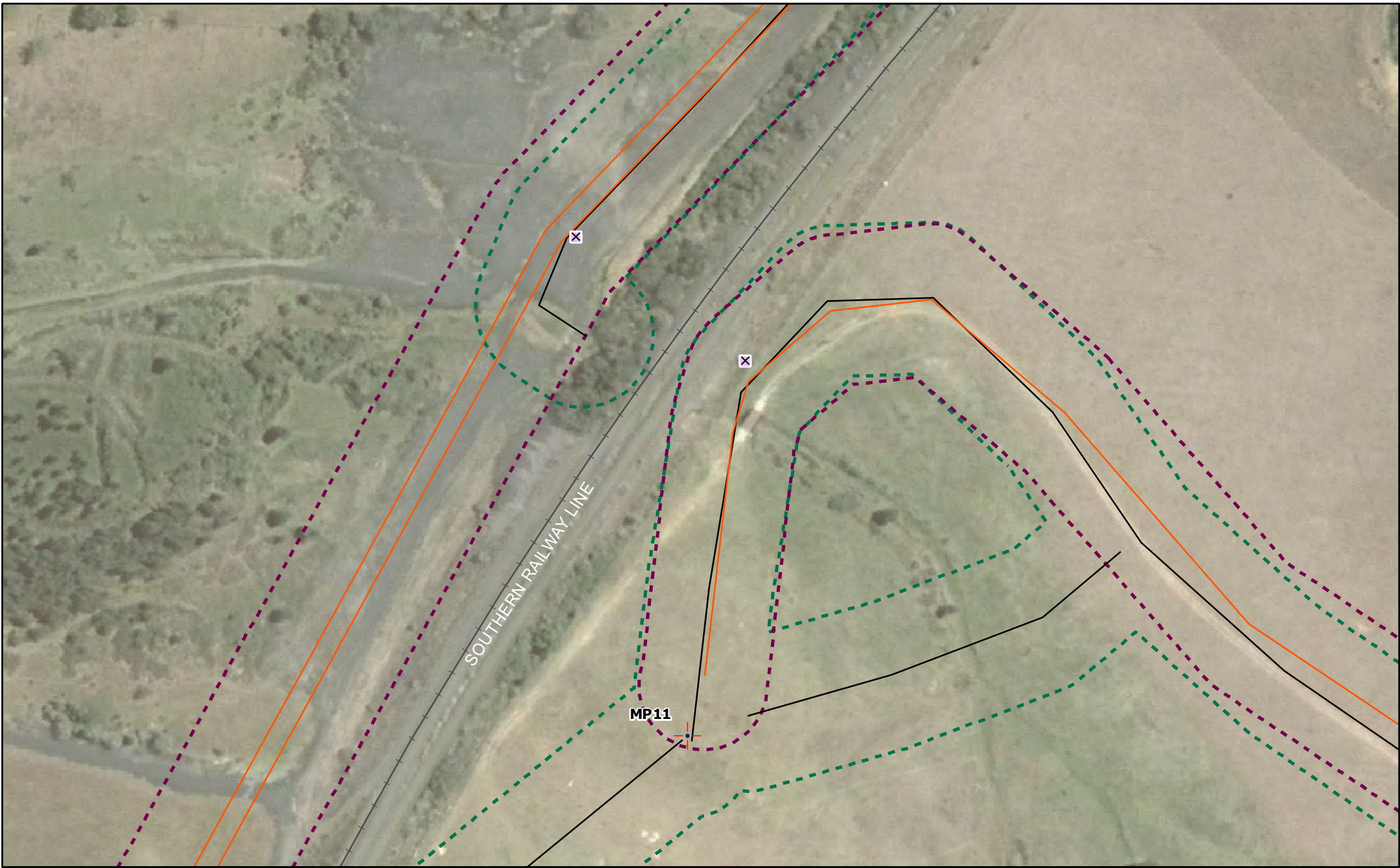
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Legend

- Wells
- Underbore
- Gathering Pipelines
- Access Road
- Modification Gathering
- Southern Railway Line
- Existing 50m Corridor Road Access
- Existing 50m Corridor Gathering
- Proposed 50m Corridor Gathering

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Author: Upstream Gas

Date: 12/10/2009

Ref: 2175

Gas Gathering line between MP06 and MP11

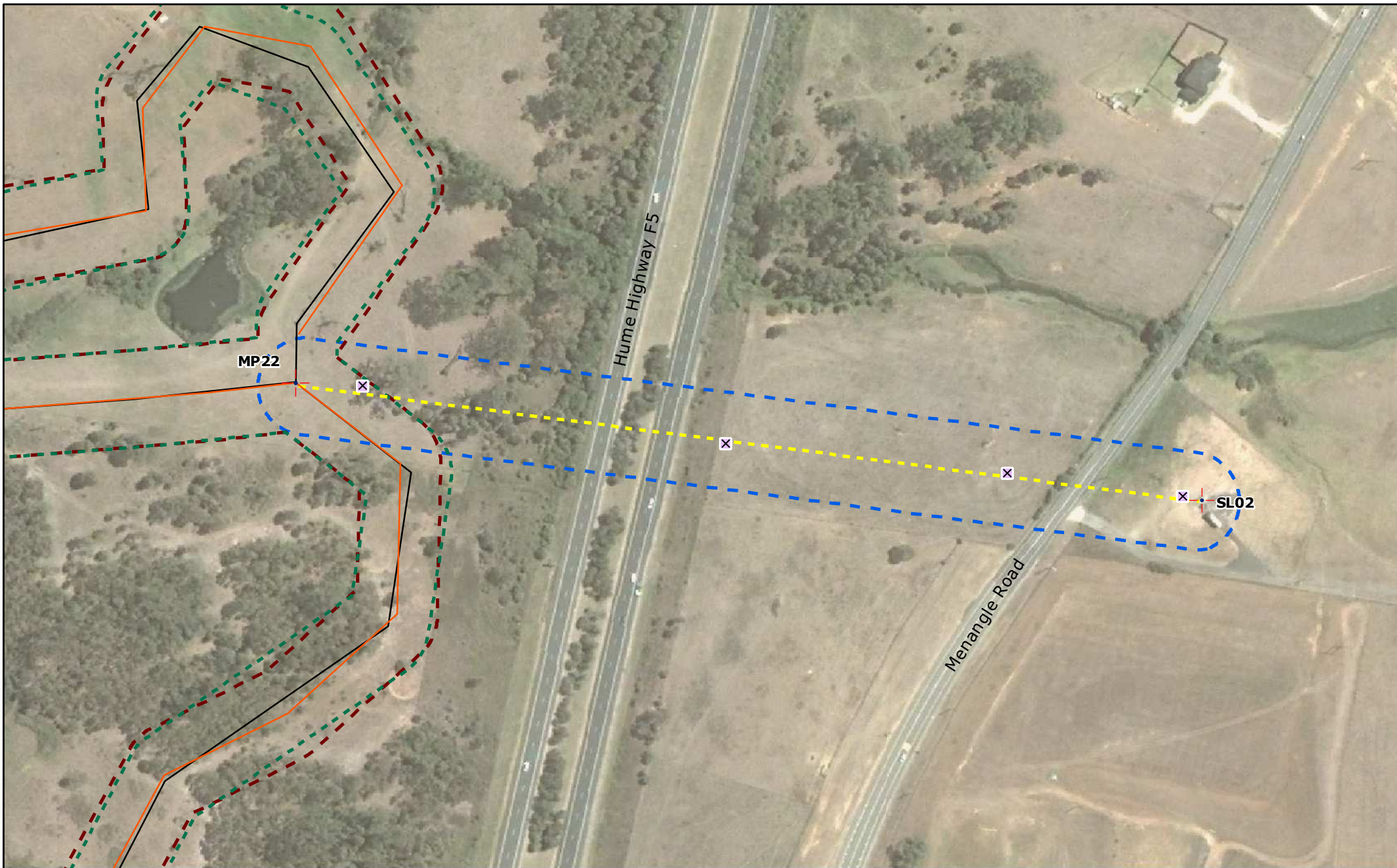
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Legend

- Wells
- Underbore
- Gathering Pipelines
- Access Road
- Southern Railway Line
- Existing 50m Corridor Gathering
- Existing 50m Corridor Road Access
- Proposed 50m Corridor Gathering

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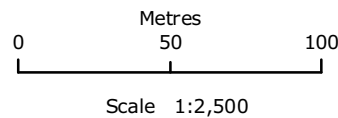
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Author: Upstream Gas

Date: 15/09/2009

Ref: 2159

Proposed Gas Gathering System between MP22 and SL02



Legend

- Wells
- Underbore
- Access Road
- Gathering Pipelines
- Modification Gathering
- Existing 50m Corridor Road Access
- Existing 50m Corridor Gathering
- Proposed 50m Corridor Gathering

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Appendix A

Natural Heritage

Flora and Fauna Assessment

Executive Summary

AGL Camden Operations Pty. Ltd. (AGL) are proposing the installation of a new gas gathering line (GGL) that will run between existing well surface locations MP03 and MP05. This is modification to the Spring Farm/Menangle Park Project Approval (PA 06_0291). The GGL runs along an existing access track adjacent to the Southern Railway Line and a utilities easement within Mount Annan Botanical Gardens, for approximately 1km.

The entire length of the new GGL corridor was surveyed and assessed for the presence of any threatened species, population or ecological communities or their habitats, as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

No threatened species were recorded during the survey. Potential habitat for nine threatened flora species and nineteen threatened fauna species occur in the study area. Impact assessments under the TSC and EPBC Acts were undertaken for *Pimelea spicata* and the Cumberland Plain Land Snail which found that the proposal was unlikely to have a significant impact. Impact assessments were not deemed necessary for the rest of the threatened or migratory fauna, as the potential habitat exists as a small and disturbed area for foraging only and the species are not likely to be dependant on the resources in the study area. A Referral to the Environment Minister is not recommended for any flora or fauna.

One section of the proposed route consists of Shale Plains Woodland. This community corresponds to the Endangered Ecological Community Cumberland Plain Woodland (DEC 20051). Significance assessments (TSC Act Assessment of Significance and EPBC Act Significant Impact Guidelines) have been carried out for Cumberland Plain Woodland and concluded that the proposal is unlikely to have a significant impact on the plant community.

A number of recommendations have been made to reduce potential impacts on flora and fauna values.

Introduction

Biosis Research Pty Ltd was commissioned to undertake a flora and fauna assessment for the new proposed GGL corridor within the existing Menangle Park Project Area, for the purposes of identifying terrestrial ecological values of significance in accordance with Section 5A of the *Environment Planning and Assessment Act 1979* (EP&A Act), TSC Act and the EPBC Act.

The assessment involved site inspection of a proposed GGL corridor between existing well surface locations MP03 and MP05. The proposed GGL runs along the top of an embankment near MP05 and runs parallel to an existing railway line and crosses under the Upper Canal

and Hume Highway to link to MP03. The proposed works will only require clearing of minimal vegetation and will result in localised ground disturbance.

This letter provides the results and recommendations from the site inspection conducted on the 30 September 2009 by Luke Baker (Biosis Research).

Methods

The general condition of the GGL corridor was assessed and observations of flora and fauna species and habitats were made (as detailed below). A random meander transect (Cropper 1993) was undertaken to record the plant species occurring within the corridor.

The fauna survey was undertaken as a habitat based assessment. Vegetation condition and fauna habitat was assessed according to the degree to which it resembles relatively natural, undisturbed vegetation/habitats.

Vegetation and fauna habitats were assessed as being in Good, Moderate or Poor condition or an unnatural landscape according to the following criteria:

- **species composition** (species richness, degree of weed invasion).
- **vegetation structure** (representation of each of the original layers of vegetation).
- **resilience** (the capacity of a site for natural regeneration, primarily linked to the degree to which the natural soil profile of the area has been disturbed).
- **habitat resources** (ground, log and litter layer; breeding, nesting, feeding and roosting resources availability).

Proposed Scope of Works

The proposed GGL corridor is a modification to the Spring Farm/Menangle Park Project Approval (PA 06_0291). To construct and operate, the proposed GGL, AGL are required to submit a modification to the existing Part 3A Project Approval to the Department of Planning (DoP), which includes undertaking the appropriate environmental assessments.

The proposed GGL corridor runs parallel to an existing access track for most of its length within the Mount Annan Botanical Gardens, and crosses under the Upper Canal and the Hume Highway to link to MP03. The proposed works will only require minimal clearing of vegetation and will result in localised ground disturbance.

The proposal may involve the clearing of up to a 5 m wide area. A trench will be dug to a minimum depth of 750mm and up to 1,200mm to install the GGL and the soil will be re-established over the laid GGL on completion of installation. Post works, the disturbed area will be left to rehabilitate. It is anticipated that the GGL will be located close to the existing access track, where practical.

For the purposes of this assessment, the **subject site** is defined as the 1 km length of the proposed GGL with a 5m wide area of potential direct impacts, covering a total of approximately 0.50 ha. To account for potential indirect impacts (e.g. edge effects such as

weed invasion) an area of 3 m in width extending into the adjacent portions of the gathering line, was also assessed. The area of indirect impacts was approximately 0.30 ha.

The **study area** is defined as the area of direct and indirect impact. The **locality** consists of a 10 km radius of the study area.

Plant Communities

Little vegetation clearing would occur as the proposed route is adjacent to an existing unsealed access track, or in cleared areas. Under-boring may take place at the Upper Canal and Hume Highway F5.

Towards the west of the study area near the Southern Railway Line, vegetation consisted of mainly exotic species, including *Digitaria sanguinalis*, *Chloris gayana*, *Verbena bonariensis*, *Eragrostis curvula* and *Senecio madagascariensis*. The shrub layer was sparse, and no canopy trees existed. Some regeneration of native vegetation was present heading east towards the Upper Canal. The regeneration is located within a fenced area, approximately 3m from the access track. Flora recorded in this section included *Themeda australis*, *Bursaria spinulosa*, *Acacia decurrens*, *Dianella revoluta* and juvenile *Eucalyptus* spp. (DBH 10-20 cm). The regeneration would most likely represent that of the nearby Cumberland Plain vegetation community. This area was impacted by exotic grasses and the nearby access track. It is recommended that this area be retained, and route be moved closer to the access track.

Vegetation to the west near the Upper Canal was dominated by exotic species. The understorey was sparse, consisting mainly of juvenile *Olea europaea* subsp. *europaea*. *Ageratina adenophora* was also present around this section. The route may be underbored at this location.

To the east of the Upper Canal the vegetation is in a Poor to Moderate condition in some sections. *Eucalyptus moluccana* and *Eucalyptus tereticornis* were the dominant canopy species. The understorey was dominated by *Olea europaea* subsp. *europaea* and ground layer exotic species. It is recommended that the GGL be constructed to the south of the existing access track, or to either side of the access track where little, or no native trees will be removed. According to NPWS (2002d) vegetation mapping, this area of vegetation is Shale Plains Woodland, with Shale Hills Woodland in close proximity. Both of these communities are components of Cumberland Plain Woodland, which is listed as an Endangered Ecological Community under both the TSC and EPBC Acts. This is supported by the presence of characteristic flora species including *Eucalyptus tereticornis*, *Eucalyptus moluccana* and *Bursaria spinosa*.

Towards the east of the Hume Highway (F5), no trees will be removed for the proposal. Flora at this section consists of mainly exotic grasses such as *Digitaria sanguinalis*, *Eragrostis curvula*, *Lolium perene*, and *Bromus mulliformis*.

Significant Plant Communities

The occurrence of native trees and few scattered native groundcover species towards the east of the Upper Canal has been mapped by NPWS (2002d) as the Shale Plains Woodland subunit of Cumberland Plain Woodland (Figure 2). This vegetation community is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the TSC Act and endangered under the EPBC Act. It is anticipated that the proposed GGL will be within close proximity to the adjacent existing access track in this area, and that no mature trees will be removed. However, the proposal will most likely require the removal of a very small amount of juvenile trees, and this vegetation community may be impacted by indirect impacts. Indirect impacts include weed invasion, soil erosion and disturbance. As a precautionary approach, Assessments of Significance under the TSC Act and the EPBC Act have been conducted for Cumberland Plain Woodland (Appendix 4). Due to the very minimal clearing of native vegetation, and minimal indirect impacts, these assessments found that the proposed development is not likely to have a significant impact on Cumberland Plain Woodland. It is determined that approximately 0.20 ha of Cumberland Plain Woodland may be impacted by the proposed GGL.

Flora

A total of 37 plant species were recorded in the study area, comprising of 17 (46%) local native species and 20 (54%) exotic species. A list of plant species recorded is provided in Appendix 1.

Lycium ferocissimum (Class 4), *Asparagus asparagoides* (Class 5), and *Lantana camara* (Class 5), and are listed as noxious weeds in the Campbelltown LGA. Class 4 means that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed. Class 5 means the requirements in the *Noxious Weeds Act 1993* for a notifiable weed must be complied with.

Significant Plant Species

None of the plant species recorded in the current survey are listed as threatened under the EPBC or TSC Acts.

A total of 28 threatened plant species or their habitats, have previously been recorded in the locality (10 km radius of the study area), as listed on the DECCW Atlas of NSW Wildlife and DEWHA EPBC Online Database (Figure 1a). Due to the proximity of previous records and/or the presence of suitable native vegetation, potential habitat may exist within the study area for 8 threatened plant species including; *Dillwynia tenuifolia*, *Pultenaea pedunculata*, *Acacia pubescens*, *Grevillea juniperina* ssp. *juniperina*, *Grevillea parviflora* ssp. *parviflora*, *Persoonia bargoensis*, *Pomaderris brunnea*, and *Pimelea spicata*.

Based on the nature of the proposal, database interrogation, literature review regarding the ecology of each species, and information gathered during field surveys within the study area, 7 of these species (*Dillwynia tenuifolia*, *Pultenaea pedunculata*, *Acacia pubescens*, *Grevillea juniperina* ssp. *juniperina*, *Grevillea parviflora* ssp. *parviflora*, *Persoonia bargoensis* and , *Pomaderris brunnea*) are considered as unlikely to be subject to negative impacts resulting from the proposal. Each of these eight species is considered to be relatively conspicuous, and if present within the small study area, would have been observed during the survey. The potential for some of these threatened plant species to be present within a soil stored seed bank in the study area is partially feasible; however, if present in the soil, the proposal would have a negligible impact. Further to this, impacts to potential habitat of these species are considered negligible due to the following;

- Impacts resulting from the proposal will be contained to an existing modified transmission line easement and access track;
- The proposal will not create any new edges and will not result in the isolation or fragmentation of potential habitat;
- The proposal is unlikely to interfere with the pollination and dispersal of native plant species;
- The proposal is unlikely to interfere with the existing fire regimes of the study area; and
- Native vegetation will be allowed to regenerate within the easement post construction (within the limits of transmission line safety clearance requirements).

Despite the negligible degree of impact that is likely to result from the proposal, further consideration of the following species has been provided based on application of the precautionary principle. One (*Pimelea spicata*) of the 9 threatened plant species with potential habitat in the study area is considered cryptic and therefore difficult to detect.

On this basis, impact assessments (TSC Act Assessment of Significance and EPBC Act Significant Impact Guidelines) were carried out for *Pimelea spicata*, (Appendix 4) and concluded that the proposal is unlikely to have a significant impact on this species.

Fauna Habitats

Suitability, size and configuration of vertebrate fauna habitats broadly correlate with the structure, connectivity and quality of local and regional plant communities. The proposed GGL corridor supports little native groundcover vegetation, with some leaf litter, debris or fallen logs. The exotic shrub layer and small tree layer would provide shelter and foraging habitat for a range of common birds and reptile species. Most of the trees within the impact area were all relatively young, with no tree hollows recorded.

Fauna Habitat Condition

The proposed corridor of the GGL was disturbed and provided only limited and highly modified habitats for native fauna. Consequently, the structural simplicity and limited micro-habitat components of the study area are expected to produce a fauna diversity that is also low. The lack of large canopy trees within the study area provides limited refuge and nesting opportunities for hollow-dwelling fauna and native and exotic avifauna.

The habitat features (shelter and foraging) within the study area are considered to be in Poor condition and provide limited opportunities for native fauna, particularly rare and threatened species. Only habitat generalist avifauna (those adapted to in urban environments) are likely to occur within the corridor on any regular basis.

Significant Fauna

A total of 55 threatened animal species have previously been recorded in the locality (10 km radius of the study area), as listed on the DECCW Atlas of NSW Wildlife and DEWHA EPBC Online Database (Figure 1b.). Of these, Brown Treecreeper (*Climacteris picumnus victoriae*), Regent Honeyeater (*Anthochaera Phrygia*), Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Scarlet Robin (*Petroica boodang*), Flame Robin (*Petroica phoenicea*), Swift Parrot (*Lathamus discolor*), Barking Owl (*Ninox connivens*), Powerful Owl (*Ninox strenua*), Cumberland Plain Land Snail (*Meridolum corneovirens*) Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*), Eastern Freetail Bat (*Mormopterus norfolkensis*), Koala (*Phascolarctos cinereus*), Grey-headed flying-fox (*Pteropus poliocephalus*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), Large-footed Myotis (*Myotis macropus*), and Greater Broad-nosed Bat (*Scoteanax rueppellii*) have potential habitat within the study area.

Potential habitat for the threatened and migratory species in the study area exists as a small area of foraging habitat only. These species are likely to only use the resources in the study area on a temporary basis and are unlikely to be dependant on these resources given the availability of similar habitats in the vicinity of the study area.

The proposed corridor of the GGL may provide potential habitat for these threatened and migratory species, however these species are unlikely to be dependent on habitat at these sites. The clearance of native vegetation and native trees will be avoided as far as is practicable. Disturbance will be up to 5m wide, generally following the existing access track, and areas dominated by noxious weed species. However, there may be the requirement for removal of some small (<10 cm DBH) native tree species. Appropriate sediment control will be employed and well maintained during and after construction. Provided that the recommendations outlined are followed, it is considered unlikely that the proposed GGL would have an impact on threatened or migratory species or their habitats.

As a precautionary approach, an Assessment of Significance under the TSC Act has been conducted for the Cumberland Plain Land Snail, as the ecology of the species is not yet fully understood, and may use the limited leaf litter within the Cumberland Plain vegetation community east of the Upper Canal, as habitat.

Assessments under the TSC and/or EPBC Act have not been prepared for any of the other fauna species in relation to the proposed development.

Statements of Commitment

While the proposed development is unlikely to have a significant impact on threatened species, endangered communities or populations, it is recommended that the following points be taken into consideration to minimise any disturbances on ecological values of the study area:

- Access to sites should be via existing access tracks;
- Native trees should be avoided as far as is practicable. Some impacts to small trees of DBH less than 10 cm may be unavoidable, but all trees greater than DBH of 10 cm will be avoided;
- Appropriate sediment and erosion control measures must be employed when working in the vicinity of drainage lines. Sediment and erosion control measures should be employed and well maintained on steep slopes;
- The disturbed areas should be rehabilitated at the completion of works, by the re-instatement of the soil profile and allowing the area to revegetate naturally;
- The area will be rehabilitated by direct broadcast of native seed previously collected, using seed bearing branches from nearby native species and
- Noxious weed material cleared along the proposed route of the gathering line should be disposed of appropriately off site at a green waste facility to limit further spread.

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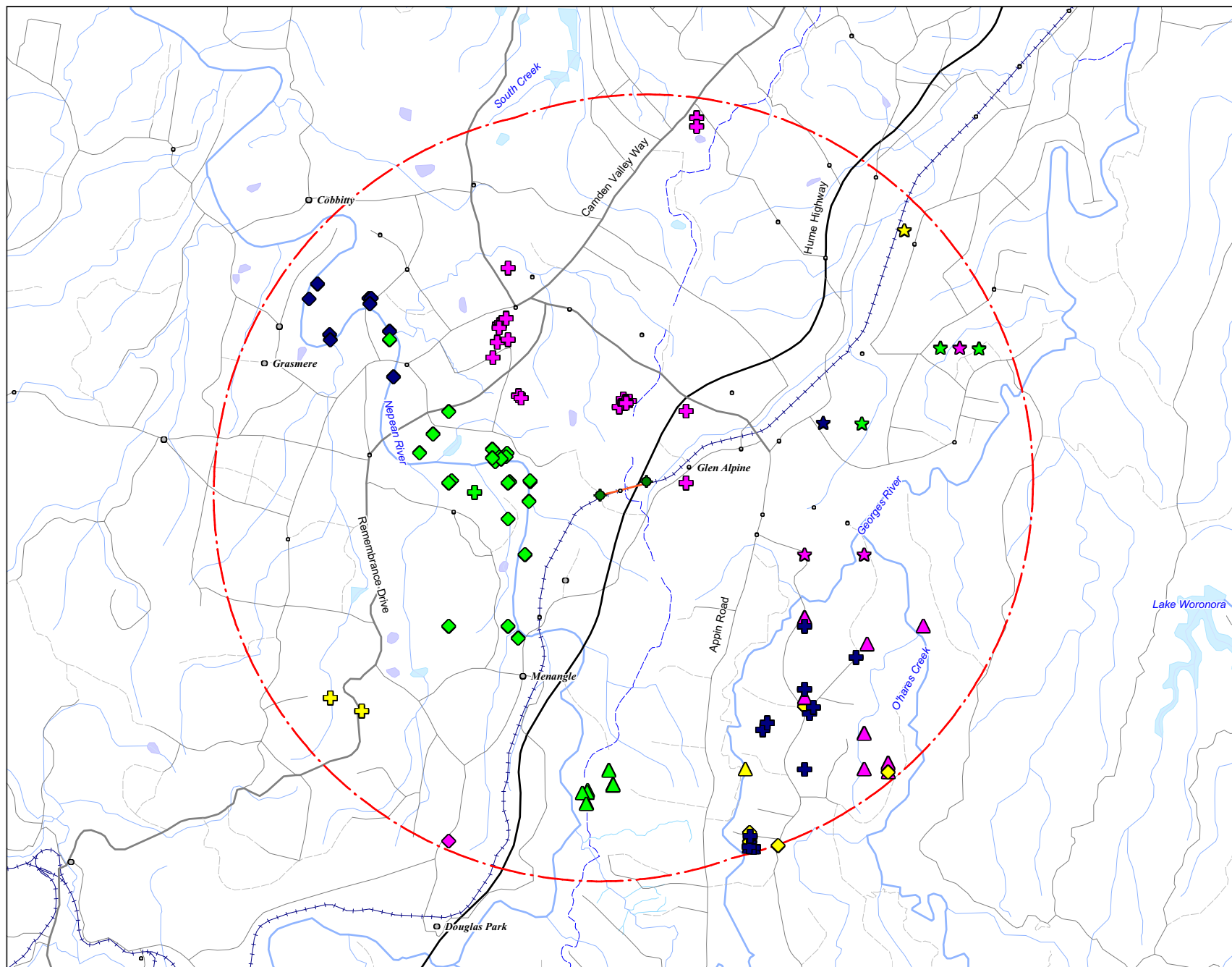
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Figures



Legend

Threatened Flora

- ◆ *Acacia bynoeana*
- ★ *Acacia pubescens*
- ▲ *Callistemon linearifolius*
- + *Cynanchum elegans*
- ◆ *Eucalyptus benthamii*
- ★ *Genoplesium baueri*
- ▲ *Grevillea parviflora ssp. parviflora*
- + *Grevillea parviflora subsp. parviflora*
- ★ *Gyrostemon thesioides*
- ★ *Leucopogon exolasius*
- ▲ *Melaleuca deanei*
- + *Pimelea spicata*
- ◆ *Pomaderris brunnea*
- ★ *Pterostylis saxicola*
- ▲ *Pultenaea pedunculata*
- + *Thesium australe*

Survey Area

- - - 10km Search Area
- ◆ Well Location
- Gathering Line

Acknowledgements:
Species data from DECCW/NPWS
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Figure 1a: Threatened flora recorded within 10km of the study area.

Date: 15 October 2009

Checked by: LLB

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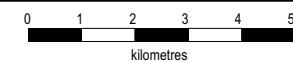


Figure 1a: Threatened flora recorded within 10km of the study area.



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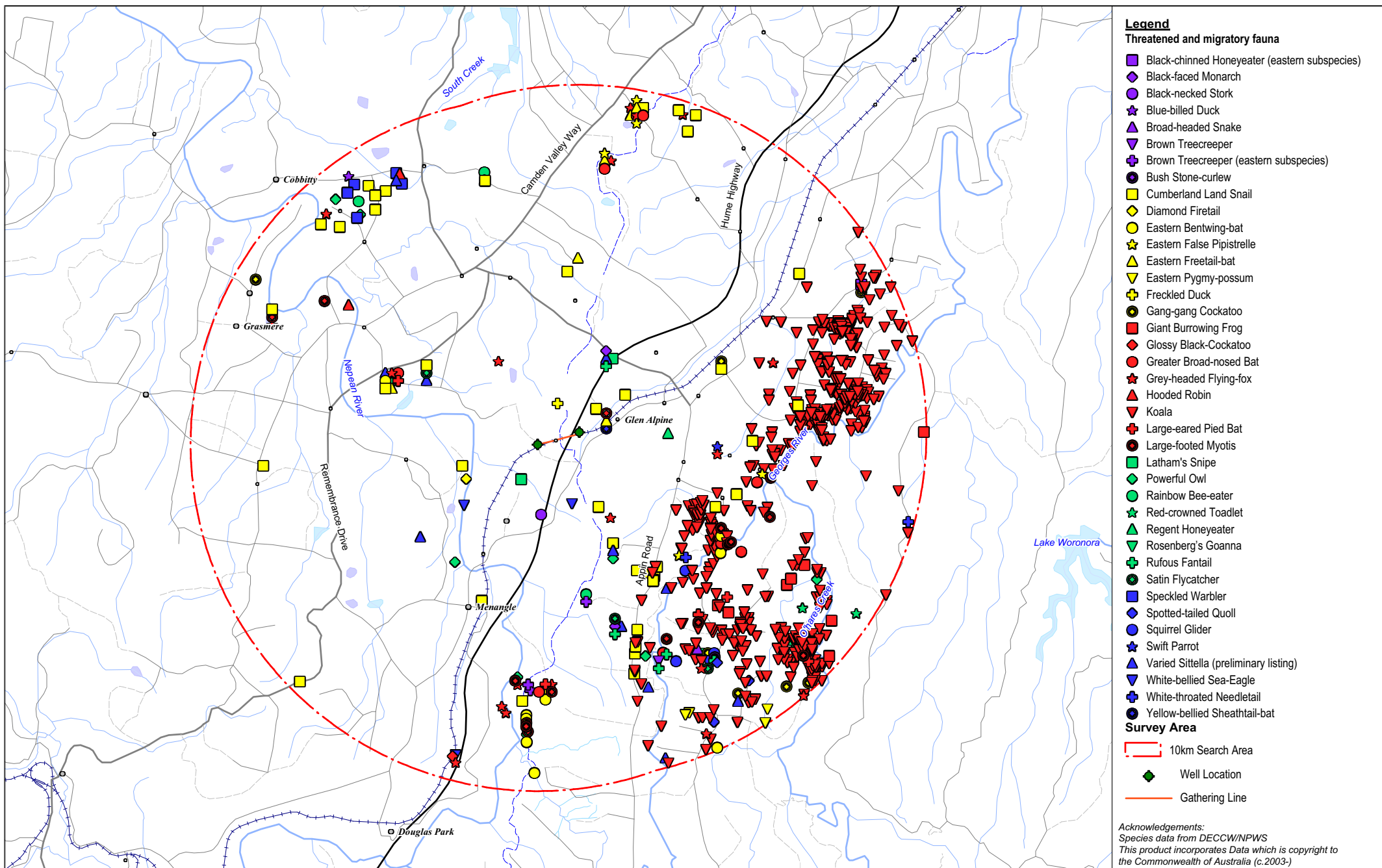


Figure 1b: Threatened and migratory fauna recorded within 10km of the study area.

Figure 1b: Threatened and migratory fauna recorded within 10km of the study area.

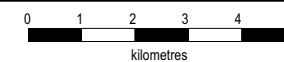
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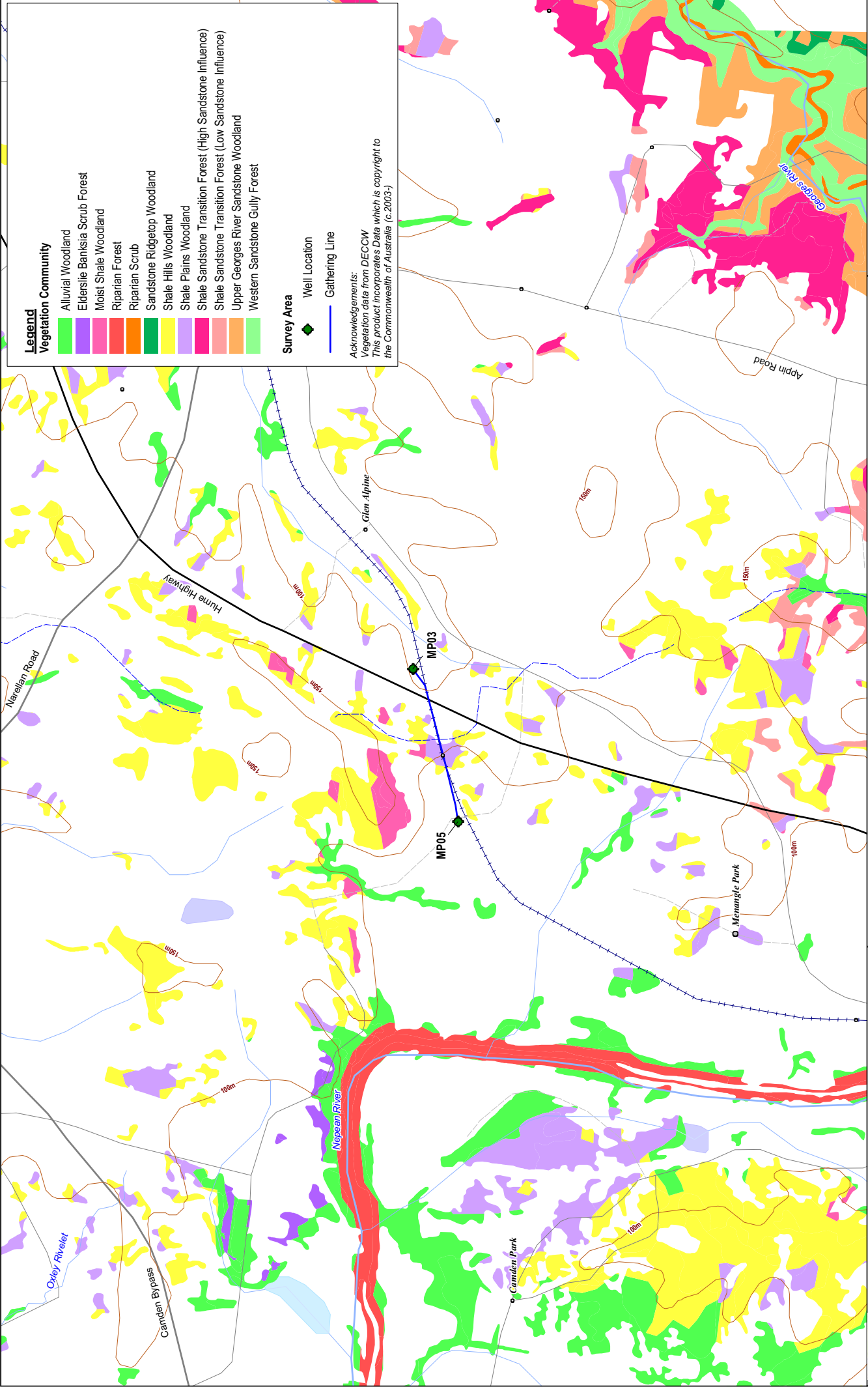


Figure 2: Vegetation communities occurring within the vicinity of the study area

Figure 2: Vegetation communities occurring within the vicinity of the study area

Appendix

Appendix 1

Plant species recorded

Family	Scientific Name	Common name
Adiantaceae		
	<i>Cheilanthes sieberi ssp. sieberi</i>	Narrow Rock-fern
Monocotyledons		
Phormiaceae		
	<i>Dianella revoluta var. revoluta</i>	Dianella
Poaceae		
	<i>Aristida ramosa var. ramosa</i>	Aristida
*	<i>Avena barbata</i>	Bearded Oats
*	<i>Briza minor</i>	Shivery Grass
*	<i>Bromus cartharticus</i>	Prairie Grass
*	<i>Bromus molliformis</i>	Bromus
*	<i>Chloris gayana</i>	Rhodes Grass
	<i>Cymbopogon refractus</i>	Barbed Wire Grass
	<i>Cynodon dactylon</i>	Common Couch
	<i>Dichelachne micrantha</i>	Shorthair Plumegrass
*	<i>Digitaria sanguinalis</i>	Crab Grass
*	<i>Eragrostis curvula</i>	African Lovegrass
*	<i>Lolium perenne</i>	Perennial Ryegrass
*	<i>Paspalum dilatatum</i>	Paspalum
	<i>Themeda australis</i>	Kangaroo Grass
Dicotyledons		
Apiaceae		
	<i>Centella asiatica</i>	Pennywort
*	<i>Foeniculum vulgare</i>	Fennel
Asteraceae		
*	<i>Ageratina adenophora</i>	Crofton Weed
	<i>Conyza spp.</i>	Conyza
*	<i>Hypochaeris radicata</i>	Catsear
*	<i>Senecio madagascariensis</i>	Fireweed
*	<i>Sonchus asper</i>	Prickly Sowthistle
Campanulaceae		
	<i>Wahlenbergia gracilis</i>	Sprawling or Australian Bluebell
Caryophyllaceae		
*	<i>Stellaria media</i>	Common Chickweed
Fabaceae (Mimosoideae)		
	<i>Acacia decurrens</i>	Black Wattle
Fabaceae (Faboideae)		
	<i>Glycine spp.</i>	Glycine
	<i>Hardenbergia violacea</i>	False Sarsaparilla
*	<i>Medicago minima</i>	Woolly Burr Medic
Malvaceae		
*	<i>Sida rhombifolia</i>	Paddy's Lucerne
Myrtaceae		
	<i>Eucalyptus moluccana</i>	Grey Box
	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Oleaceae		
*	<i>Olea europaea ssp. cuspidata</i>	Common Olive
Pittosporaceae		
	<i>Bursaria spinosa ssp. spinosa</i>	Sweet Bursaria

Plantaginaceae

*	<i>Plantago lanceolata</i>	Lamb's Tongues
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Verbenaceae

*	<i>Lantana camara</i>	Lantana
*	<i>Verbena bonariensis</i>	Purpletop

Note: * signifies exotic species

Appendix 2

Threatened plant species likely to occur within a 10 km radius of the local area

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)

2) Listed on the TSC Act as Endangered (E1), Extinct (E4) or Vulnerable (V)

Latin Name/ Common Name	EPBC Act ¹	TSC Act (NSW) ²	Habitat	Potential Habitat
<i>Pultenaea parviflora</i>	V	E1	<i>Pultenaea parviflora</i> is endemic to the Cumberland Plain, with a core distribution from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. <i>P. parviflora</i> may be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays and in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland (NPWS 2002e). Often found in association with other threatened species such as <i>Dillwynia tenuifolia</i> , <i>Dodonaea falcata</i> , <i>Grevillea juniperina</i> , <i>Micromyrtus minutiflora</i> , <i>Persoonia nutans</i> and <i>Styphelia laeta</i> . Flowering may occur between August and November depending on environmental conditions (DEC 2005t).	No
<i>Cynanchum elegans</i> White-flowered Wax Plant	E	E1	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. Catchment Management Regions include Hawkesbury/Nepean, Hunter/Central Rivers, Northern Rivers, Southern Rivers and Sydney Metropolitan (DEC 2005f). <i>Cynanchum elegans</i> usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; <i>Leptospermum laevigatum</i> , <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> ; <i>Eucalyptus tereticornis</i> open forest and woodland; <i>Eucalyptus maculata</i> open forest and woodland; and <i>Melaleuca armillaris</i> scrub to open scrub (DEC 2005f). Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific (DEC 2005f).	No
<i>Lepidium hyssopifolium</i> Basalt Peppergrass	E	E1	Associated with introduced weedy species that tend to populated areas that receive little maintenance and are generally allowed to lie as derelict pasture. Original habitat is eucalypt woodland with grassy groundcover, low open casuarina woodland with a grassy ground cover and tussock grassland (Cropper 1987).	No
<i>Leucopogon exolasius</i> Woronora Beard-heath	V	V	Occurs in Hawkesbury/Nepean and Sydney Metropolitan Catchment (DEC 2005f), restricted to the Woronora and Grose Rivers (Harden 1991). The plant occurs in woodland on sandy alluvium and rocky sandstone hillsides near creeks, and on low nutrient soils (Powell 2007). Flowering occurs in August and September (Harden 1991). Associated species include <i>Eucalyptus piperita</i> and <i>E. sieberi</i> and the shrubs <i>Pultenaea flexilis</i> , <i>Leptospermum trinervium</i> and <i>Dillwynia retorta</i> (Powell 2007).	No
<i>Leucopogon fletcheri</i> ssp. <i>fletcheri</i>		E1	Found in woodland (Harden 1992) on clayey lateritic soils between the Wianamatta Shale and Hawkesbury Sandstone, generally on flat to gently sloping along ridges and spurs (NSW Scientific Committee 1999). Flowers August to September. Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains (DEC 2005m).	No
<i>Dillwynia tenuifolia</i>	V	V1	In western Sydney, may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland (DEC 2005d). <i>Eucalyptus fibrosa</i> is likely to be a dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or codominant (NPWS 2002a). Flowering occurs sporadically from August to March depending on environmental conditions. Surveys should initially concentrate in open areas within woodland/open forest, particularly targeting areas possessing laterised gravels, or low rises which have a well developed or regenerating low shrub layer (NPWS 2002a).	Yes
<i>Pultenaea pedunculata</i> Matted Bush-pea		E1	Restricted to the Cumberland Plain and near Merimbula where it grows in dry sclerophyll forest and disturbed sites (Harden 2002). In western Sydney it occurs in three locations: within industrial and residential areas at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel No. 2 (NPWS 2002f). Associated with Hawkesbury/Nepean, Southern Rivers and Sydney Metropolitan Catchment areas. It occurs in clay or sandy clay soils (Blacktown soil landscape) on Wianamatta shale, close to localised patches of Tertiary alluvium (Liverpool) or the shale/sandstone influence (west of Appin) (DEC 2005u). At all sites there is a	Yes

			lateritic influence in the soil with characteristic ironstone gravels present (DEC 2005u). This species is known to occur in remnants of Cooks River Clay Plain Scrub Forest (James <i>et al.</i> 1999).	
<i>Acacia bynoeana</i> Bynoe's Wattle	V	E1	<i>Acacia bynoeana</i> is found in central eastern NSW, in the following catchment regions – Hawkesbury/Nepean, Hunter/Central Rivers, Southern Rivers, and Sydney Metropolitan. More specifically it is found from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra (DEC 2005a). It seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and recently burnt patches (DEC 2005a). It grows in sandy clay soils often containing ironstone gravels (Fairley 2004). Main vegetation types include heath or dry sclerophyll forest on sandy soils (DEC 2005a). Associated overstorey species include <i>Corymbia gummifera</i> , <i>Corymbia maculata</i> , <i>Eucalyptus parramattensis</i> , <i>Banksia serrata</i> and <i>Angophora bakeri</i> (DEC 2005a). Flowering period is mainly summer	No
<i>Acacia pubescens</i> Downy Wattle	V	V	<i>Acacia pubescens</i> is found in Sydney Metropolitan, and Hawkesbury/Nepean Catchment Management Region, with concentrated populations around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon (NPWS 2003). It occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. The species occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland (NPWS 2003). Flowers from August to October. The pods mature in October to December (NPWS 2003).	Yes
<i>Gyrostemon thesioides</i>		E1	Within NSW, has only ever been recorded at three sites, to the west and south of Sydney, near the Colo, Georges and Nepean Rivers. The most recent sighting was of a single male plant near the Colo River within Wollemi National Park. The species has not been recorded from the Nepean and Georges Rivers for 90 and 30 years respectively, despite searches. Also occurs also in Western Australia, South Australia, Victoria and Tasmania. Grows on hillsides and riverbanks and may be restricted to fine sandy soils (DEC 2005j).	No
<i>Callistemon linearifolius</i>		V	Occurs chiefly from Georges River to the Hawkesbury River where it grows in dry sclerophyll forest (Harden 2002), open forest, scrubland (Fairley and Moore 2000) or woodland on sandstone. Found in damp places, usually in gullies (Robinson 1994). Flowers in Spring.	No
<i>Eucalyptus benthamii</i> Nepean River Gum	V	V	Known from two main locations: Bents Basin and Kedumba Valley. A few scattered individuals are recorded from other sites on the sandy alluvial flats of the Kedumba/Cox/Nepean River system. Occurs only in wet open forest on sandy alluvial soils along valley floors at an elevation of 140-750 m. The soils are shallow to moderately deep and are well drained alluvial sands and gravels along stream channels, small terraces and alluvial flats (NPWS 2000b). Restricted but locally abundant (Harden 1991). ROTAP; 2Vi	No
<i>Eucalyptus scoparia</i> Wallangarra White Gum	V	E1	Occurs in Queensland and recently found in NSW on the northern tablelands where it grows on well drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland (NSW Scientific Committee 2002).	No
<i>Melaleuca deanei</i> Dean's Melaleuca	V	V	<i>Melaleuca deanei</i> occurs in Catchment Management Regions Hawkesbury/Nepean, Southern Rivers, and Sydney Metropolitan. Distinctly it occurs in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas (DEC 2005o). The species grows in wet heath on sandstone (Harden 1991) and Dry Sclerophyll Forests. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate (DEC 2005o).	No
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	V	V	Subtropical and littoral rainforest on sandy soils or stabilised dunes near the sea (Harden 1991). Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities (DEC 2005y). The species occurs in the following Catchment Authority Regions - Hunter/Central Rivers, Hawkesbury/Nepean, Sydney Metropolitan, and Southern Rivers.	No
<i>Diuris aequalis</i>	V	E1	<i>Diuris aequalis</i> has been recorded in Kanangra-Boyd National Park, Gurnang	No

Buttercup Doubletail			State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago and Bungendore. Catchment Management Regions include: Hawkesbury/Nepean, Lachlan, Murrumbidgee, Southern Rivers and Sydney Metropolitan (DEC 2005e). Recorded in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands (especially on the Great Dividing Range) (DEC 2005e). It favours gravelly clay-loam, often on gentle slopes (Bishop 1996). Like most <i>Diuris</i> species, the flowers mimic native pea flowers to attract pollinators; in this case the model is a small-flowered wedge-pea (<i>Gompholobium</i> sp.), with which it always grows. Flowering occurs between mid-October and mid-November in the southern part of its range, and between mid-November and early December in the populations north of the Abercrombie River (DEC 2005e).	
<i>Diuris lanceolata</i>	E		Grows in moist grassy areas, among shrubs in sclerophyll forest and heath; coast and tablelands (Harden 1993).	No
Snake Orchid				
<i>Genoplesium baueri</i>		V	This terrestrial orchid species grows in open sclerophyll forest or moss gardens on sandstone. Typically the habitat is a drier heathy forest (Harden 1993) (Bishop 1996). The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. Flowers Dec. - Mar (DEC 2005g).	No
Bauer's Midge Orchid				
<i>Pterostylis nigricans</i>		V	The Dark Greenhood occurs in north-east NSW north from Evans Head, and in Queensland. Grows in coastal heathland with Heath Banksia (<i>Banksia ericifolia</i>), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils.	No
Dark Greenhood				
<i>Pterostylis saxicola</i>	E	E1	Restricted to western Sydney between Freemans Reach in the north and Picton in the south (Hawkesbury/Nepean and Sydney Metropolitan Catchment) (DEC 2005}). Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils (DEC 2005}). All species of <i>Pterostylis</i> are deciduous and die back to fleshy, rounded underground tuberoids. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant wither and die following seed dispersal and the plant persists as a tuberoid until the next year (DEC 2005}).	No
Sydney Plains Greenhood				
<i>Thelymitra</i> sp. <i>Kangaloon</i>	Z		<i>Thelymitra</i> sp. <i>Kangaloon</i> is a terrestrial orchid endemic to New South Wales, and is known from three locations near Robertson in the Southern Highlands. The swamp habitat in which the species occurs has an extent of occurrence of 300 km ² and an area of occupancy of 10 km ² . The three swamps are Butlers Swamp, Stockyard Swamp and Wildes Meadow Swamp, and are all located above what is known as the Kangaloon aquifer. It flowers in late October and early November. The species grows amongst tall sedges and rushes in seasonally swampy sedgeland on grey silty clay loam at 600-700 m above sea level (Threatened Species Listing Advice, 2008 20176 /id).	No
<i>Grevillea juniperina</i> ssp. <i>juniperina</i>		V	It's distribution is centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town (NPWS 2002b). It is found on clay soils in open forest on the Cumberland Plain (Robinson 1994). Grows in moist sites, usually near creek on acidic soils (Harden 1991).	Yes
<i>Grevillea parviflora</i> ssp. <i>Parviflora</i>	V	V	Located in Hawkesbury/Nepean, Hunter/Central Rivers and Sydney Metropolitan Catchment. Sporadically distributed throughout the Sydney Basin with the main occurrence centred in Picton, Appin, Wedderburn and Bargo. Northern populations are found in the Lower Hunter Valley. To the west of Sydney, small populations occur at Kemps Creek & Voyager Point (DEC 2005i). <i>Grevillea parviflora</i> ssp. <i>parviflora</i> grows on sandy clay loam soils, often with ironstone gravels. Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones (NPWS 2002c). <i>Grevillea parviflora</i> subsp. <i>parviflora</i> is found on crests, upper slopes or flat plains in both low-lying areas and on higher topography. The plant prefers open habitat conditions with the largest populations in open woodland and along exposed roadside areas (NPWS 2002c). <i>G. parviflora</i> subsp. <i>parviflora</i> has been recorded in a range of vegetation types from heath and shrubby woodland to open forest. Canopy species vary greatly with community type but generally are species that favour soils with a	Yes
Small-flower Grevillea				

			strong lateritic influence including <i>Eucalyptus fibrosa</i> , <i>E. parramattensis</i> , <i>Angophora bakeri</i> and <i>Eucalyptus sclerophylla</i> (NPWS 2002c).. Flowering has been recorded between July to December as well as April-May (NPWS 2002c).	
<i>Persoonia bargoensis</i> Bargo Geebung	V	E1	Found in the Sydney Metropolitan and Hawkesbury/Nepean Catchment Authority Regions. Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau. Its entire range falls between Picton, Douglas Park, Yanderra, Cataract River and Thirlmere (DEC 2005p). <i>P. bargoensis</i> grows in woodland to dry sclerophyll forest on sandstone and clayey laterite on heavier, well drained, loamy, gravelly soils of the Hawkesbury Sandstone and Wianamatta Shale (NPWS 2000c). More specifically, <i>P. bargoensis</i> seems to prefer the interfaces between shale-derived soils such as the Blacktown Soil Landscape, the complex soils of the Mittagong Formation (Lucas Heights Soil Landscape), and the underlying sandstone (Hawkesbury and Gynea Soil Landscapes). Some of the vegetation in which <i>P. bargoensis</i> occurs can be recognised as the endangered Shale/Sandstone Transition Forest (NPWS 2000c). This species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (DEC 2005p). Flowering occurs mainly in summer but can extend into autumn (NPWS 2000c).	Yes
<i>Persoonia nutans</i> Nodding Geebung	E	E1	Occurs in Hawkesbury/Nepean and Sydney Metropolitan Catchment. Restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south. Core distribution occurs within the Penrith LGA, and to a lesser extent, Hawkesbury LGA. Small populations also occur in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs (DEC 2005q). Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland (DEC 2005q). <i>P. nutans</i> also occurs on Shale/Gravel Transition Forest and Cooks River Castlereagh Ironbark Forest (DEC 2005f). In Castlereagh Scribbly Gum Woodlands it is found in open woodland with dominant overstorey species being <i>Angophora bakeri</i>, <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i>. The Agnes Banks Woodlands have a similar array of tree species, with the addition of <i>Banksia serrata</i> and <i>Banksia aemula</i> (DEC 2005f). <i>Persoonia nutans</i> is found on the Agnes Banks and Berkshire Park soil landscapes. Drainage appears to influence the distribution of <i>P. nutans</i> as the species is more common on the deeper sands at Agnes Banks. At other locations on the Cumberland Plain it occurs on low rises as opposed to swales or other low lying areas (DEC 2005f).	No
<i>Pomaderris brunnea</i> Rufous Pomaderris	V	V	<i>Pomaderris brunnea</i> is found in a very limited area around the Nepean and Hawkesbury Rivers, including the Bargo area. Occurs in the Central West, Hawkesbury/Nepean, Hunter/Central Rivers Catchments. Occurs on clay & alluvial soils (Fairley and Moore 1995). In the Hawkesbury/Nepean region, the species is known to be associated with Dry sclerophyll forests (Cumberland, Upper Riverina, Sydney Coastal, Sydney Hinterland, Sydney Sand Flats), Coastal Floodplain Wetlands and Coastal Valley Grassy Woodlands (DEC 2005r). Flowers appear in September and October.	Yes
<i>Thesium australe</i> Austral Toad-flax	V	V	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. <i>Thesium australe</i> is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass (DEC 2005z). It is often found in damp sites in association with Themeda australe, but also found on other grass species at inland sites (G. Leonard pers. obs.). Occurs on clay soils in grassy woodlands or coastal headlands (James <i>et al.</i> 1999).	No
<i>Pimelea spicata</i> Spiked Rice-flower	E	E1	Once widespread on the Cumberland Plain, <i>Pimelea spicata</i> occurs in two disjunct areas, the Cumberland Plain and the Illawarra. Catchment areas are Hawkesbury/Nepean, Southern Rivers, and Sydney Metropolitan Catchment (NPWS 2000d). In western Sydney, <i>P. spicata</i> occurs on an undulating topography of substrates derived from Wianamatta Shale in areas supporting, or that previously supported, the Cumberland Plain Woodland Vegetation Community (NPWS 2004). Associated species include: <i>Eucalyptus moluccana</i>, <i>E. tereticornis</i>, <i>E. crebra</i>, <i>Bursaria spinosa</i>, and <i>Themeda australis</i> (NPWS 2004). In the Illawarra region, <i>P. spicata</i> is found in open woodland and also in coastal grassland communities with emergent shrubs. Dominant species within the woodland habitat include <i>Eucalyptus tereticornis</i>, <i>E. eugenioides</i>,	Yes

			<i>Themeda australis</i>, and <i>Lomandra longifolia</i>. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a more well developed shrub and grass understorey (NPWS 2004). <i>Pimelea spicata</i> flowers sporadically throughout the year, with flowering likely to depend upon climatic conditions, particularly rainfall. Flowering times recorded for <i>P. spicata</i> vary. Rye (1990) noted flowering period as May - January; Benson and McDougall (2001) noted peak flowering period as March/ April (NPWS 2000d).	
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Appendix 3

Threatened animal species likely to occur within a 10 km radius of the local area

Key: 1) Listed on the EPBC Act as Critically Endangered (Z), Endangered (E) or Vulnerable (V) or covered under migratory provisions (M) on the EPBC Act
2) Listed on the TSC Act as Endangered (E), Vulnerable (V)

Latin Name	EPBC Act ¹	TSC Act (NSW) ²	Habitat	Potential habitat
Amphibians				
<i>Litoria aurea</i> Green and Golden Bell Frog	V	E1	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (White and Pyke 2008). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999c; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005h).	No
<i>Litoria littlejohni</i> Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker <i>et al.</i> 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker <i>et al.</i> 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
<i>Litoria reniformis</i> Southern Bell Frog	V	E1	In NSW the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks (Robinson 1993; DEC 2005w).	No
<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996; Recsei 1996). Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker <i>et al.</i> 1995). Spends the majority of its time in non-breeding habitat 20-250m from breeding sites (Penman <i>et al.</i> 2008).	No
<i>Pseudophryne australis</i> Red-crowned Toadlet		V	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams (Thumm and Mahony 1997). Breeds all year round (Thumm and Mahoney 2002).	No
Birds				
<i>Circus assimilis</i> Spotted Harrier		PD	Open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. More common in drier inland areas, nomadic part migratory and dispersive, movements linked to abundance of prey species. Nest in open or remnant woodland (Marchant and Higgins 1993). Unlike other harriers nests in trees.	No
<i>Haliaeetus leucogaster</i> White-bellied Sea-eagle	M		A migratory species that is generally sedentary in Australia, although immatures and some adults are dispersive (Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees (Marchant and Higgins 1993).	No (may fly over study area).
<i>Lophoictinia isura</i> Square-tailed Kite		V	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia (Marchant and Higgins 1993). In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> (NPWS 1999f). Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging	No

			habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs (Marchant and Higgins 1993).	
<i>Oxyura australis</i> Blue-billed Duck		V	Almost wholly aquatic, preferring deep water in large, permanent wetlands with an abundant aquatic flora (Marchant and Higgins 1990).	No
<i>Stictonetta naevosa</i> Freckled Duck		V	The freckled duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits (Simpson and Day 1996).	No (may fly over study area)
<i>Anseranas semipalmata</i> Magpie Goose		V	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. They are often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes (DEC 2005n). Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level. Nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW (DEC 2005n). Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation (DEC 2005n).	No
<i>Apus pacificus</i> Fork-tailed Swift	M		Almost exclusively aerial (foraging and roosting). Breed in Asia (Higgins 1999).	No (may fly over study area)
<i>Hirundapus caudacutus</i> White-throated Needletail	M		An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breed in Asia (Pizzey and Knight 1997).	No (may fly over study area)
<i>Ardea alba</i> Great Egret	M		Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare salt pans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990).	No
<i>Ardea ibis</i> Cattle Egret	M		Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990).	No
<i>Artamus leucorhynchus</i> White-browed Woodswallow		PD	Mainly inhabits open eucalypt, sheoak and Acacia woodland; forest; riparian zones; and, grasslands with few or no trees and sparsely scattered shrubs (including farmland) (Higgins <i>et al.</i> 2006). In NSW the species is widespread on the inland slopes of the Great Divide and western plains; occurs more sparsely east of the Great Divide (Higgins <i>et al.</i> 2006). The species eats arthropods, including insects that swarm above vegetation, plus some nectar and small native fruits (NSW Scientific Committee 2009). Will nest in a tree fork, tree crevice, foliage, vine, stump or artificial structure (NSW Scientific Committee 2009).	No
<i>Burhinus grallarius</i> Bush Stone-curlew		E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	No
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo		V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	No (may forage within the locality).
<i>Calyptrorhynchus lathami</i> Glossy Black-cockatoo		V	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types (NPWS 1999b). Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead (Higgins 1999).	No
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)		V	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	Yes, limited.
<i>Monarcha melanopsis</i> Black-faced Monarch	M		A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey and Knight 1997).	No
<i>Myiagra cyanoleuca</i> Satin Flycatcher	M		Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey and Knight 1997).	No
<i>Rhipidura rufifrons</i> Rufous Fantail	M		Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey and Knight 1997).	No
<i>Anthochaera Phrygia</i> Regent Honeyeater	E	E1	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999d; Pizzey and Knight 1997).	Yes, limited foraging

			Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemos</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>Corymbia maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> , and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>A. miquelii</i> , <i>A. pendula</i> , <i>A. cambagei</i> are also eaten during the breeding season (DEC 2005v). Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female (DEC 2005v).	habitat only.
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)		V	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins <i>et al.</i> 2001). It is rarely recorded east of the Great Dividing Range (Higgins <i>et al.</i> 2001).	Yes, limited.
<i>Merops ornatus</i> Rainbow Bee-eater	M		Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter (Higgins 1999).	No
<i>Daphoenositta chrysoptera</i> Varied Sittella		PD	Inhabit a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia (Higgins and Peter 2002). Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	Yes, limited.
<i>Pyrrholaemus sagittatus</i> Speckled Warbler		V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers <i>et al.</i> 1984; NSW Scientific Committee 2008). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers <i>et al.</i> 1984; NSW Scientific Committee 2008). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2008).	No
<i>Stagonopleura guttata</i> Diamond Firetail		V	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997). Often occur in vegetation along watercourses (Higgins <i>et al.</i> 2006).	Yes
<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern form)		V	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000).	No
<i>Petroica boodang</i> Scarlet Robin		PD	The Scarlet Robin's range includes all state capitals. Occurs in forests, woodlands; and heavier vegetation when breeding. During autumn and winter occurs in more open and cleared areas. It has dispersive or locally migratory seasonal movements. Is conspicuous in open and suburban habitats (Morcombe 2003).	Yes, marginal.
<i>Petroica phoenicea</i> Flame Robin		PD	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border (Australian Museum 2009). The species is also found in Tasmania. The preferred habitat in summer includes eucalyptus forests and woodland, whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January (Morcombe 2003).	Yes
<i>Lathamus discolor</i> Swift Parrot	E	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> (DEC 2005x). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997).	Yes, limited foraging habitat only.
<i>Rostratula australis</i> Australian Painted Snipe	VM	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).	No
<i>Gallinago hardwickii</i> Latham's Snipe	M		Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No
<i>Tringa nebularia</i> Common Greenshank	M		Widely distributed throughout a range of inland wetlands and sheltered coastal habitats. Occurs in habitats with varying salinity (Higgins and Davies 1996).	No

<i>Ninox connivens</i> Barking Owl		V	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey and Knight 1997). Territories range from 30 to 200 ha (DEC 2005b).	Yes, foraging habitat and limited roosting opportunities.
<i>Ninox strenua</i> Powerful Owl		V	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas (Debus and Chafer 1994b; Debus and Chafer 1994a). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997). Has a large home range of between 450 and 1450 hectares (DEC 2005s).	Yes, foraging habitat and limited roosting opportunities.
Invertebrates				
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail		E1	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 1999a).	Yes
Mammals				
<i>Cercartetus nanus</i> Eastern Pygmy-possum		V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period (Ward 1990).	No
<i>Dasyurus maculatus maculates</i> Spotted-tailed Quoll (southeastern mainland)	E	V	Occurs along the east coast of Australia and the Great Dividing Range (Belcher <i>et al.</i> 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995). 70% of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999e). The home range of a female is between 180 – 1000 ha, while males have larger home ranges of between 2000 – 5000 ha. Breeding occurs from May to August (Belcher <i>et al.</i> 2008).	No
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail Bat		V	Found throughout NSW. They have been reported from southern Australia between January and April. Reported from a wide range of habitats throughout eastern and northern Australia, including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies of up to 30 (but more usually two to six) and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. It is high-flying, making it difficult to detect. It forages above the canopy of eucalypt forests, but comes lower to the ground in mallee or open country (Churchill 2008; Richards 2008).	Yes, foraging habitat only.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	V	E1	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices, particularly where these have a northerly aspect. Individuals defend a specific rock shelter, emerging in the evening to forage on grasses and forbs, as well as browse in drier months. Home sizes range from 2-30 ha (Eldridge and Close 1995).	No
<i>Mormopterus norfolkensis</i> Eastern Freetail Bat		V	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites (Churchill 2008; Hoye <i>et al.</i> 2008).	Yes, foraging habitat only.
<i>Petaurus norfolkensis</i> Squirrel Glider		V	Sparsely distributed along the east coast and immediate inland areas as far west as Coonabarabran (DEC 1999) in the northern part of the state and as far west as Tocumwal along the southern border of the state (Van der Ree and Suckling 2008). Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Require abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Van der Ree	No

			and Suckling 2008). Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked (Menkhorst <i>et al.</i> 1988). They live in family groups of 2-10 individuals and maintain home ranges of 0.65 and 10.5 hectares, varying according to habitat quality and food resource availability (Quin 1995; Goldingay and Jackson 2004).	
<i>Phascolarctos cinereus</i> Koala		V	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region (DEC 2005k). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally (Martin <i>et al.</i> 2008). Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> (DoP 1995). They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha (Martin <i>et al.</i> 2008).	Yes
<i>Potorous tridactylus</i> Long-nosed Potoroo	V	V	Occurs from Queensland to Victoria, normally within 50 km of the coast (Claridge <i>et al.</i> 2007). Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy. Known to eat fungi, arthropods, fleshy fruit, seeds and plant tissue. It is solitary and sedentary, but tends to aggregate in small groups. It has two breeding seasons, one in late winter-early spring and the other in late summer. (Johnston 2008). This species appears to benefit from a lack of recent disturbance (Claridge <i>et al.</i> 2007).	No
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	Yes, foraging habitat only.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley (van dyck and Strahan 2008). Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands (Churchill 2008; Hoyer and Schulz 2008). Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months (Churchill 2008). The only known existing maternity roost is in a sandstone cave near Coonabarabran (Pennay 2008).	No
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle		V	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet sclerophyll and coastal mallee, preferring wet forests with a dense understorey but being found in open forests at lower altitudes (Churchill 2008). Roosts in tree hollows and sometimes in buildings and caves, in colonies of between 3 and 80. Often change roosts every night. Has a large foraging range, up to 136 ha (Churchill 2008; Law <i>et al.</i> 2008). Records show movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	Yes, foraging habitat only.
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing Bat		V	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways (Churchill 2008; Hoyer and Hall 2008).	Yes, foraging habitat only.
<i>Myotis macropus</i> Large-footed Myotis		V	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects (Richards <i>et al.</i> 2008).	Yes, foraging habitat only.
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat		V	Occurs along the Great Dividing Range, up to 1200m, and in coastal areas. Occurs in woodland and rainforest, but prefers open habitats or natural or human-made openings in wetter forests. Often hunts along creeks or river corridors. Flies slowly and directly at a height of 30m or so to catch beetles and other large, flying insects. Also known to eat other bats and spiders. Roosts in hollow tree trunks and branches (Churchill, 2008 20071 /id; Richards, 2008 19570 /id).	Yes, foraging habitat only.
Reptiles				
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996; Webb and Shine 1998).	No
<i>Varanus rosenbergi</i> Rosenberg's Goanna		V	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992).	No

Appendix 4

TSC Act Assessment of Significance

Pimelea spicata

Pimelea spicata is listed as an endangered species on Schedule 1 of the TSC Act.

Pimelea spicata is a small spreading or erect shrub growing to 50 cm (NPWS 2004b).

Pimelea spicata is known to occur in areas supporting or areas previously supporting Cumberland Plain Woodland.

A small amount of Cumberland Plain Woodland may be impacted by the proposal. Some of the land which has been cleared would have previously supported Cumberland Plain. Some regeneration is occurring, particularly to the west of the Upper Canal. The proposal will impact on approximately 0.20 ha of potential habitat for *Pimelea spicata*.

(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.

Pimelea spicata was not recorded in the study area. Potential habitat for the species does, however, exist within the study area. Since no individuals were recorded in the study area, it is unlikely that the proposal will have an adverse impact on the lifecycle of the species such that a viable local population will be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect 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.

N/A.

(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.

N/A.

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

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

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

(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.

Pimelea spicata has previously been recorded at numerous locations to the north and to the east of the study area (Figure 1a). In the study area, potential habitat for the species occurs in the cleared paddock areas that previously supported Cumberland Plain Woodland, and in the patch of Cumberland Plain to the west of the Upper Canal.

The potential habitat for this species within the study area is in Poor condition with most native vegetation cleared and the area dominated by exotic pasture grasses and weeds. Approximately 0.20 ha of potential habitat will be impacted by the proposal. The area of potential habitat for *Pimelea spicata* that will be removed as part of the proposed development represents a small proportion of similar habitat types in the locality.

The proposal will not result in fragmentation or isolation of areas of habitat for *Pimelea spicata* given that the area is already cleared of native vegetation and the proposal will not result in any permanent barriers.

Given the condition and size of the potential habitat to be removed, and the fact that no individuals were recorded during the current survey, the potential habitat to be disturbed as part of the proposal is not considered to be vital for the long term survival of the local population.

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

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Pimelea spicata*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A draft recovery plan has been prepared for *Pimelea spicata* (DEC 2004). The overall objective of this recovery plan is to ensure the continued and long-term survival of *P. spicata* in the wild by promoting the *in-situ* conservation of the species across its natural range. Specific recovery objectives include:

- conserve *P. spicata* using land-use and conservation planning mechanisms;
 - identify and minimise the operation of threats at sites where *P. spicata* occurs;
 - develop and implement a survey and monitoring program that will provide information on the extent and viability of *P. spicata*;
 - provide the community with information that assists in conserving the species;
 - raise awareness of the species and involve the community in the recovery program;
- and,
- conduct research that will assist future management decisions.

Since *Pimelea spicata* is not known to occur at the site, the removal of 0.20 ha of potential habitat is not considered to be inconsistent with the objectives or actions of the recovery plan.

(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.

Since the impacted area consists of mainly of already cleared areas dominated by exotic species, and a relatively small patch of Cumberland Plain vegetation which has an understorey and mid layer dominated by weeds, the proposal is not likely to constitute or increase the operation of a key threatening process listed under the TSC Act.

Conclusion

Pimelea spicata is known to occur within 10 km of the study area; however, it was not recorded during the field surveys for this assessment. Potential habitat for this species that will be impacted by the proposed development represents a relatively small area and is degraded. For these reasons it is considered unlikely that the proposed development would have a significant impact on this species.

Cumberland Land Snail (*Meridolum corneovirens*)

Cumberland Land Snails occur in on the Cumberland Plain west of Sydney, generally associated with Cumberland Plain Woodland. Cumberland Land Snails live under the litter of bark, leaves and logs, or shelter in loose soil around grass clumps, and feed on fungus. During drought the snail will burrow deeper into the soil to avoid the dry conditions (NPWS 1999a).

Habitat for this species is present within the disturbed Cumberland Plain Woodland to the east of upper canal within the study area. Although it is anticipated that the proposed gathering line will be located adjacent to the existing road, and that all trees will be retained, there is the possibility that some small trees and shrubs will be impacted directly and indirectly. As a

precaution, it is estimated that approximately 0.20 ha of potential habitat may be impacted by the proposal.

(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.

Very little is known of the ecology and biology of the Cumberland Land Snail. It occurs within Cumberland Plain Woodland, Castlereagh Woodlands of the Cumberland Plain. The snails feed on fungus associated with decaying leaf litter and bark of eucalypts. Cumberland Land Snails can probably breed year-round, laying up to 25 eggs when conditions are suitable (i.e. damp). It is not known what number of individuals constitutes a viable local population, or what the dispersal patterns are or how far individuals can travel (NPWS 1999a; NPWS 2000a).

No individuals were found in the study area.

Some disturbance to the ground will occur, including removal of groundcover and soil where the GGL corridor is located. Most of the disturbance will occur close to the existing access track, and will not require the removal of mature trees. A large amount of leaf litter was not present at the site along the existing access track where the GGL corridor is located. The proposal is unlikely to impact on breeding and dispersal within the local population as similar vegetation exists in the adjacent property. Impacts can be avoided or minimised if pole placement takes into account habitat for the Cumberland Land Snail.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect 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.

N/A.

(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.

N/A

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

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

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

(DEC 2005c) 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 study area is approximately 0.8 ha in size (potential area of indirect and direct impacts). Additional potential habitat is present in Cumberland Plain Woodland adjacent to the subject site in the study area and elsewhere in the locality. The proposed GGL may involve the direct and indirect impacts to approximately 0.20 ha of potential habitat.

It is not known how far individual snails travel or what their dispersal patterns are (NPWS 1999a). The installation of the GGL may involve the removal of some trees, as well as ground disturbance, which will reduce habitat, however habitat will not become fragmented or isolated as a result of the proposal. Similar habitat is present immediately adjacent to the subject site, and throughout the locality.

The small-scale disturbance from the proposal will not cause significant fragmentation or isolation of habitat for the local Cumberland Land Snail population. The subject site is adjacent to an area of Cumberland Plain Woodland which is also likely to provide habitat for this species.

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

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for the Cumberland Land Snail.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for this species. Nine priority actions have been identified to assist in the recovery of the Cumberland land Snail. Relevant recovery objectives include:

- Ensure public land plans of management include appropriate actions for species' protection;

- Install structures (where necessary) to prevent accidental slashing and removal of plant debris; and
- Implement weed control at sites where necessary.

As only a small portion of potential habitat will be impacted for this species, the proposal is not considered to be inconsistent with the above priority actions.

(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.

‘Clearing of native vegetation’ is listed as a Key Threatening Process and is relevant to the Cumberland Land Snail (NPWS 1999a). Clearing of vegetation can disturb native habitat and lead to an increase in weeds. The proposal will result in the minor clearing of ground layer vegetation and the removal of some trees, which will impact the Cumberland Land Snail.

‘Ecological consequence of high frequency fires’ is a Key Threatening Process that can impact the Cumberland Land Snail (NPWS 1999a). The proposal is not likely to result in or increase the impact of fires in the study area.

Conclusion

The proposal would impact upon a very small area of habitat, compared to a large area of potential habitat available in the locality. The proposal is unlikely to fragment or isolate any local populations of this species. For these reasons it is considered **unlikely** that the proposal would have a significant impact on the Cumberland Land Snail.

Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) is listed as an Endangered Ecological Community in Part 3 of Schedule 1 of the TSC Act.

Cumberland Plain Woodland (Shale Plains Woodland) occurs in the study area to the east of the Upper Canal will be impacted by the proposal. The majority of the CPW is in Poor condition, with impacts from previous disturbances including the road, weed invasion, and fragmentation resulting in a low diversity of native species in the understorey and exotic species present in both the midstorey and understorey.

Although it is anticipated that the proposed GGL will be located adjacent to the existing access track, and that all trees will be retained, there is the possibility that some small trees and shrubs will be impacted directly and indirectly. As a precautionary approach, it is estimated that approximately 0.20 ha may be impacted by the proposal.

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.

N/A.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect 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.

N/A.

(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.

Vegetation mapping (NPWS 2002d) indicates that approximately 2620.5 ha of CPW (Shale Plains Woodland and Shale Hills Woodland) occurs within the locality of the study area. The proposal will result in the direct impacts to approximately 0.20 ha of CPW from along the disturbed roadside edges of the access track.

The portion of CPW that will be impacted as a result of the proposal is already highly modified through disturbances such as weed invasion, fragmentation and edge effects. Given the presence of ongoing disturbances, without significant resources allocated to its rehabilitation it is likely that the patch will further degrade with time.

The species composition of each patch of CPW is already modified, with highly invasive exotic species present in most structural layers. The ecosystem functioning of this community has been significantly altered due to the variety of disturbances that the vegetation is exposed to.

The proposal will occur in already modified areas of CPW that are unlikely to naturally regenerate without significant resources allocated to its rehabilitation. Given the small area of CPW to be impacted by the proposal and its current condition, the proposal is not considered as likely to place the local occurrence of CPW at risk of extinction.

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

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

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

(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.

NPWS (2002d) have mapped approximately 2620.5 ha of CPW (Shale Plains Woodland and Shale Hills Woodland) in the locality of the study area. The CPW within the study area is in a Poor condition, with exotic species present in most structural layers and ecosystem functioning modified due to the high number of disturbances the community is exposed to. Approximately 0.20 ha of CPW will be impacted by the proposal.

The area that will be impacted as part of the proposal equates to 0.007% of the extent of the community in the locality.

The area of CPW to be disturbed is along an existing roadside edge and will not result in further fragmentation or isolation of any CPW.

Given the condition and area of CPW to be impacted, this patch of vegetation is not considered to be vital for the long term survival of the community in the locality, as it is likely to degrade further with time unless a significant amount of resources are allocated to its rehabilitation.

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

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for CPW.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan for CPW is currently being prepared. The Endangered Ecological Community Information for CPW (NPWS 2004a) refers to regeneration of disturbed patches and maintaining all structural layers, including the understorey, to ensure the viability of the remnant. In its present state, the understorey is not intact, with a low diversity of native species present. A large amount of resources would need to be dedicated to the regeneration of CPW in the study area to make it viable in the long term.

(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.

Clearing of native vegetation is listed as a Key Threatening Process. The proposal will involve clearing for the gathering line route. The area of clearing is likely to be less than 0.20 ha of CPW.

Conclusion

Given the size and condition of the CPW that will be impacted by the proposal, the clearance of modified CPW within the study area is considered unlikely to have a significant effect on this Endangered Ecological Community.

EPBC Act Significant Impact Criteria

Pimelea spicata

Pimelea spicata is listed as Endangered on the EPBC Act. This species was considered to have potential habitat in the cleared paddock areas that previously supported Cumberland Plain Woodland in the study area, and in the patch of Cumberland Plain to the east of the Upper Canal. This equates to 0.20 ha of potential habitat that will be impacted by the proposed GGL.

Is the action likely to lead to a long-term decrease in the size of a population?

Pimelea spicata was not recorded in the study area. The removal of 0.20 ha of poor condition potential habitat for *Pimelea spicata* is not likely to lead to a long term decrease in the size of a population.

Is the action likely to reduce the area of occupancy of the species?

Pimelea spicata is known to occur in western Sydney, with the known distribution extending from Mount Annan and Narellan Vale in the south to Freemans Reach in the north and from Penrith in the west to Georges Hall in the east (NPWS 2004b). The removal of 0.20 ha of potential habitat for the species in Menangle is not likely to reduce the area of occupancy of the species as the study area is not at the limit of the known distribution.

Is the action likely to fragment an existing population into two or more populations?

Pimelea spicata was not recorded in the study area. The closest records are approximately 1.5 km to the north and approximately 1 km to the east of the study area (Figure 1a). The proposal will not result in fragmentation of an existing population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?

Habitat critical to the survival of a species is defined as (DEH 2005):

- a) habitat identified in a recovery plan for the species as habitat critical for those species or communities; and/or
- b) habitat listed on the Register of Critical Habitat maintained by the Minister under the Act; and/or
- c) areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for succession;
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

To date, there is no critical habitat listed by the Minister for the Department of the Environment, Water, Heritage and the Arts for *Pimelea spicata*.

The potential habitat in the study area is not an area considered to be necessary for breeding, dispersal or succession; to maintain genetic diversity; or for the reintroduction of populations or recovery of the species. Therefore, the proposal will not impact on habitat critical to the survival of the *Pimelea spicata*.

Is the action likely to disrupt the breeding cycle of a population?

Pimelea spicata was not recorded in the study area. The removal of 0.20 ha of poor condition potential habitat for *Pimelea spicata* is not likely to disrupt the breeding cycle of a population.

Is the action likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Pimelea spicata was not recorded in the study area. The proposal will result in the removal of 0.20 ha of potential habitat for the species. The proposal will not result in fragmentation or isolation of areas of habitat for *Pimelea spicata* given that the area is already cleared of native vegetation and the proposal will not result in any permanent barriers.

The removal of 0.20 ha of potential habitat from a cleared paddock area dominated by exotic species will not result in a decline of the species.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?

The potential habitat for *Pimelea spicata* is currently dominated by exotic species. Given the existing dominance of exotic grasses and herbaceous weeds, it is unlikely that the proposal will result in further invasion of weed species in the area.

Is the action likely to interfere with the recovery of the species?

No Recovery Plan as published by DEWAH is available for *Pimelea spicata* (Department of Environment and Heritage 2005), however, a draft recovery plan

has been prepared for *Pimelea spicata* by NSW Department of Environment and Climate Change (DEC 2004). The overall objective of this recovery plan is to ensure the continued and long-term survival of *P. spicata* in the wild by promoting the *in-situ* conservation of the species across its natural range. Specific recovery objectives include:

- conserve *P. spicata* using land-use and conservation planning mechanisms;
- identify and minimise the operation of threats at sites where *P. spicata* occurs;
- develop and implement a survey and monitoring program that will provide information on the extent and viability of *P. spicata*;
- provide the community with information that assists in conserving the species;
- raise awareness of the species and involve the community in the recovery program; and
- conduct research that will assist future management decisions.

Since *Pimelea spicata* is not known to occur at the site, the removal of 0.20 ha of poor condition potential habitat is not considered to be inconsistent with the objectives or actions of the recovery plan.

Conclusion

Based on the above assessment, *Pimelea spicata* is unlikely to be significantly impacted by the proposal and, as such, a referral under the provisions of the EPBC Act is not recommended for this species.

Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) is listed as an Endangered Ecological Community on the EPBC Act. This community was recorded within the study area just to the east of the Upper Canal. Although it is anticipated that the proposed GGL will be located adjacent to the existing access track, and that all trees will be retained, there is the possibility that some small trees and shrubs will be impacted directly and indirectly. As a precautionary approach, it is estimated that approximately 0.20 ha may be impacted by the proposal.

Is the action likely to lead to a long-term adverse affect on an ecological community?

Cumberland Plain Woodland within the study area is highly modified through weed invasion, fragmentation and edge effects. The area that will be impacted by the proposal is in Poor condition. Given the condition and small size of the area to be impacted, the loss or modification of 0.20 ha is not considered likely to have long-term adverse impact on the ecological community.

Is the action likely to reduce the extent of a community?

NPWS (2002d) Vegetation mapping indicates that approximately 2620.5 ha of CPW (Shale Plains Woodland and Shale Hills Woodland) occurs within the locality of the study area. This mapping also shows the plant community generally occurs as small disturbed remnants within the Mount Annan Botanical Gardens, and throughout agricultural land and developed land. The proposal will result in direct impacts to approximately 0.20 ha of CPW from along the already disturbed access track.

Is the action likely to fragment an occurrence of the community?

The removal or modification of vegetation along the roadside edge would not result in the further isolation of any areas of CPW, as it will widen the existing cleared land.

Is the action likely to adversely affect habitat critical to the survival of an ecological community?

The Threatened Species Scientific Committee and the Minister for the Environment, Water Resources, Heritage and the Arts maintain a register of critical habitat. To date, there is no critical habitat listed for Cumberland Plain Woodland.

Is the action likely to modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival?

The proposal will result in the removal or modification of 0.20 ha of CPW that is in Poor condition. The action is not likely to modify or destroy abiotic factors that are necessary for the survival of the remaining patches of CPW in the vicinity of the study area, as the disturbance area will be restricted to a 5m wide easement and the proposal will not involve use of any chemicals or result in disturbance to the soil profile of the adjoining vegetation. The disturbance of 0.20 ha of CPW is not considered likely to impact on the community's survival.

Is the action likely to result in invasive species that are harmful to the critically endangered or endangered community becoming established in an occurrence of the community?

Given the presence of invasive weed species in the study area, there is potential for further weed dispersal post clearing, however, given the high density of exotic weeds in adjacent (largely cleared) areas it is considered unlikely to further impact CPW in the study area.

Is the action likely to interfere with the recovery of an ecological community?

A recovery plan for CPW is currently being prepared. The Endangered Ecological Community Information for CPW (NPWS 2004a) refers to regeneration of disturbed patches and maintaining all structural layers, including the understorey, to ensure the viability of the remnant. In its present state, the understorey of CPW in the study area is not intact, with a low diversity of native species present in less than 5% of the study area. A large amount of resources would need to be dedicated to the regeneration of CPW in the study area to make it viable in the long term.

Conclusion

Based on the above assessment, CPW is unlikely to be significantly impacted by the proposal and, as such, a Referral under the provisions of the EPBC Act is not recommended for this ecological community.



Appendix B

Cultural Heritage

Cultural Heritage Assessment

Executive Summary

AGL Camden Operations Pty. Ltd. (AGL) are proposing the installation of a new gas gathering line (GGL) that will run between existing well surface locations MP03 and MP05. This is a modification to the Spring Farm/Menangle Park Project Approval (PA 06_0291) and proposed GGL is located within the Menangle Park Project Area. The GGL corridor runs along an existing access track adjacent to the Southern Railway Line and utilities easement within Mount Annan Botanical Gardens, for a length of approximately 1km (Figure 1).

The entire length of the proposed GGL corridor, known as the study area, was surveyed and assessed for the presence of Aboriginal archaeological sites, historical features and areas of archaeological potential. Two Aboriginal sites and no historical sites were identified.

Introduction

Biosis Research Pty Ltd was commissioned to undertake an archaeological assessment the new proposed GGL corridor within the existing Menangle Park Project Area. The assessment was based on background information outlined in the previous archaeological report (HLA ENSR 2007) and the results of the site inspection. This assessment is an addendum to the previous Aboriginal Heritage Assessment (HLA ENSR 2007) undertaken for the original Project Application, which included the Menangle Park Project Area. This assessment was undertaken for a proposed GGL linking of MP03 and MP05 from the aforementioned report. The following report provides the results and recommendations from the site inspection conducted on Wednesday 30 September 2009.

Development Proposal – Scope of Works

The proposed GGL corridor is a modification to the Spring Farm/Menangle Park Project Approval (PA 06_0291). Prior to commencement of construction and operation of the GGL, AGL are required to submit a modification to the existing Part 3A Project Approval to the Department of Planning (DoP) under section 75W of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act), which includes undertaking the appropriate environmental assessments.

The assessment involves site inspection of a proposed GGL corridor between existing well site surface locations MP03 and MP05. The proposed GGL corridor runs from near MP05 parallel to an existing railway line and utilities easement and crosses under the Upper Canal and the Hume Highway to link to MP03. The proposed works will only require clearing of minimal vegetation and will result in localised ground disturbance.

The GGL corridor is situated on land currently owned by the Mount Annan Botanical Gardens.

Aboriginal Consultation

The Aboriginal stakeholders that had been previously involved in the original Archaeological Heritage Assessment (HLA ENSR 2007) of the Camden Gas Project Stage II, which included the Menangle Park Project Area, were consulted for this section 75W modification. This included participants from the Tharawal Local Aboriginal Land Council (LALC), (Donna Whillock) and Cubbitch Barta Native Title Claimants Aboriginal Corporation (NTCAC) (Glenda Chalker). A copy of this report has been forwarded to both groups for comment.

Archaeological Context

The Nepean River hill slopes south of Camden have been subject to continuous archaeological study during the last 20 years. Most of this work has been undertaken for impact assessments and a small number of archaeological excavations. A number of cultural heritage studies have been completed in the vicinity of the study area region that has resulted in the identification of a number of both Aboriginal and historical archaeological sites.

Aboriginal archaeological sites have been previously recorded on the Nepean River terraces and hill slopes adjacent to the study area where ground disturbance has been minimal (Figure 2). The study area for the GGL would have had archaeological potential prior to significant modification from existing and previous land uses, as it occurs along undulating hills.

HLA- Envirosiences Pty Limited (2007) was commissioned to undertake an Aboriginal Heritage Assessment as part of the Environmental Assessment for the Spring Farm and Menangle Park Project Areas, which is located south of the current study area. The Menangle Park Project Area involved the construction of 12 well surface locations, access roads, GGLs and water transfer pipelines. Two of these well surface locations were MP03 and MP05, which will be linked by the proposed GGL, which was assessed as part of this addendum. This survey revealed 21 previously unregistered sites all of which were either isolated artefacts or open camp sites.

Navin Officer Heritage Consultants Pty Ltd (2008) undertook a Cultural Heritage Assessment at Mount Annan, NSW for 66kV overhead lines for Integral Energy. The study area for this assessment adjoins the northern boundary of the current proposed GGL corridor. During this survey a total of three archaeological sites were identified; MA 1 and PAD MA1 (52-2-3636) and MA 2. Site MA 2 is located within the current study area and was previously registered as five stone artefacts on the access track in the southwest extent of the proposed power lines. All of the artefacts were flake fragments. During the current survey none of the previously registered artefacts were relocated, however there were three stone artefacts and one fragment of a historical bottle identified. Previously registered site Mount Annan, Macarthur Sub-station Site 1 (52-2-3316), which is also an artefact scatter was not relocated during either the Navin Officer or this current survey.

Registered Aboriginal Sites

There were three Aboriginal archaeological sites, including two previously registered sites, recorded within the proposed GGL corridor between existing well surface locations MP03 and MP05 (Figure 3). These sites are:

- CG-IA-16
- Mount Annan, Macarthur Sub-station Site 1 (52-2-3316); and
- MA 2

MA 2 was originally registered as five flake fragments. During the current survey none of the previously registered artefacts were relocated, however there were three previously unidentified artefacts and 1 fragment of a historical bottle relocated. These artefacts were moved off the road, to behind the orange fencing that identified the previously registered artefacts.



Plate 1: Stone artefacts identified at MA 2



Plate 2: General area where artefacts relocated at MA 2

CG-IA-16 was recorded during the current survey, just south of MA 2. The site consists of a single isolated silcrete flake.



Plate 3: Single stone artefact CG-IA-16



Plate 4: General location of site CG-IA-16

Mount Annan, Macarthur Sub-station Site 1 (52-2-3316) is recorded as an isolated red silcrete artefact, and this site was not relocated during the current survey.

These sites have been recorded in areas of previous disturbance (on an existing access track and adjacent to a utilities easement and the Southern Railway Line).

Recorded Historical Sites

There are no previously recorded historical archaeological sites at or within close proximity to the proposed GGL corridor between MP03 and MP05.

Survey Methods

A comprehensive ground surface inspection was conducted along the entire proposed GGL modification corridor, which is approximately 1km long and 5m wide. Observations of archaeological exposure, ground surface visibility, extent and type of disturbance (if present), and landform element were made during the site inspection and a photographic record was kept (see below Table). The proposed GGL corridor was navigated by using a hand-held GPS unit and a topographic map. During the site inspections the weather was hot and sunny.

Results

The survey of the gas gathering line replacement was carried out by Renée Regal (Biosis Research), Donna Whillock (Tharawal Local Aboriginal Land Council) and Glenda Chalker (Cubbitch Barta Native Title Aboriginal Claimants) on 30 September 2009. The table on the following page presents the results of the site survey. All coordinates listed below were recorded in Map Grid of Australia.

Gas Gathering Line Replacement					
Position (56H)	FROM: E 293 353 N 6226 179	TO: E 294 553 N 6226 561			
Landform	Context	Disturbance	Exposure %	Visibility %	Archaeology
Undulating plain, at lower slopes to flat	Heavily modified native vegetation of moderate hill slopes adjacent to the Hume Highway and an existing railway line	Existing access track along top of hill and existing drainage channel down the hill slope.	30%	15%	1 previously unrecorded site and 2 registered sites
Notes					
The proposed GGL corridor is situated on an area that has been heavily modified in association with the existing land use. There is a frequently used access track, which is part of the Mount Annan Botanical Gardens, where site MA 2 was identified, which runs parallel to the railway line and Hume Highway. Site CG-IA-16 was located on the embankment of the railway line, which the proposed GGL corridor which runs parallel to. The previous development of the Hume Highway and Southern Railway Line has resulted in significant levels of ground disturbance and significant modification of the original landscape. Areas of good ground surface visibility occurred along the access track as well as along the railway embankment, although exposures have been subject to vehicle access. Other sections of the corridor were heavily grassed providing no ground surface visibility. As previously mentioned, there were two Aboriginal archaeological sites identified within the proposed GGL corridor. MA 2 and CG-IA-16 both which consist of stone artefacts, whilst site Mount Annan Sub-station Site 1 (52-2-3316) is located within close proximity to the proposed GGL corridor. No historical sites or features were identified during the field survey.					
Issues and Recommendations					
Due to the location of two of the Aboriginal archaeological sites being within the proposed GGL corridor, it is recommended that both MA 2 and CG-IA-16 be collected and then relocated, prior to the construction of the GGL, so as to not destroy the sites. The Tharawal LALC and the Cubbitch Barta NTCAC have agreed with the above recommendation.					

Summary

The proposed GGL corridor was surveyed and assessed for the presence of any Aboriginal sites, historical features or areas of archaeological potential. The proposed alignment of the GGL corridor is considered to have low archaeological potential due to the extensive previous ground disturbance associated with the existing drainage channel down the slope of the hill. There were two previously unregistered Aboriginal archaeological sites identified along the proposed GGL corridor.

Advice and Recommendations

As per section 6.0 Heritage Management Principles of Biosis Research (2008) *Camden Gas Project Aboriginal Cultural Heritage Management Plan*, which forms part of the existing Environmental Management System for the Camden Gas Project, it is recommended that:

- *Archaeological material be avoided through relocation; as redirecting the gas gathering line will result in impacts to previously undisturbed vegetation and cultural landscapes.*
- *All vehicles and work movements must stay in previously cleared and disturbed areas along the existing access track and cut drainage channel.*
- *All Aboriginal objects and places are protected under the NSW National Parks and Wildlife Act 1974. Should any Aboriginal relics be encountered during works associated with this proposal, works must cease in the vicinity of the find and the NSW Department of Environment, Climate Change and Water (DECCW) as well as Aboriginal stakeholders be notified. A qualified archaeologist may also be required to assess the find.*
- *It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the NSW Department of Environment, Climate Change and Water (DECCW).*

All management strategies within this Aboriginal Cultural Heritage Management Plan (ACHMP) have been formulated in consultation with the Tharawal LALC and Cubbitch Barta NTCAC.

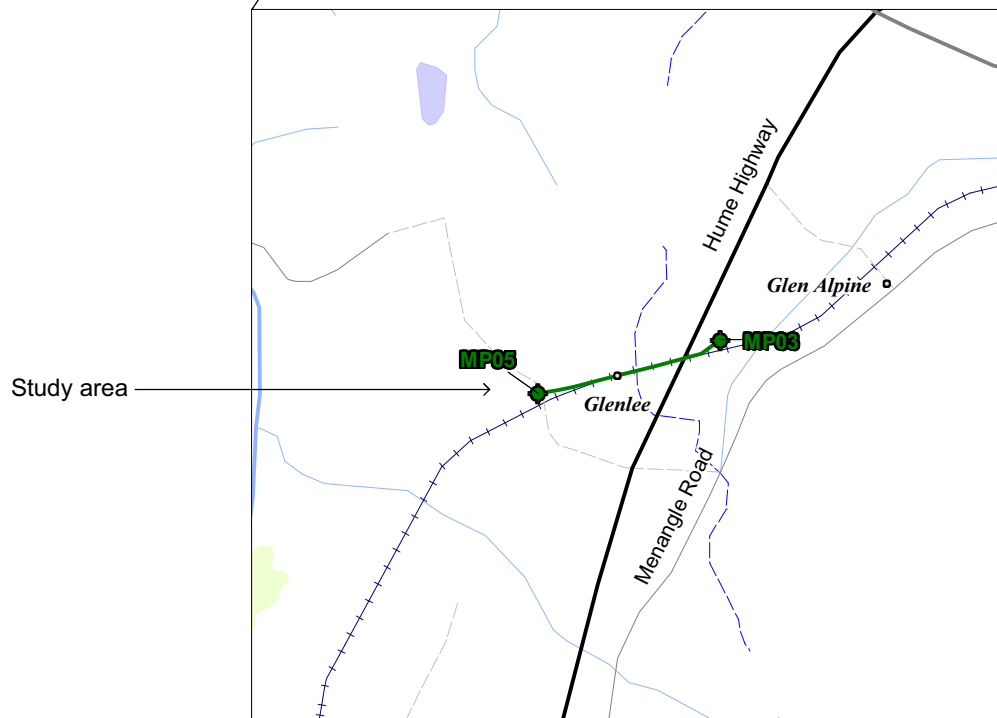
REFERENCES

Biosis Research (2008) *Camden Gas Project: Aboriginal Cultural Heritage Management Plan* An unpublished report for AGL (Camden) Pty Limited

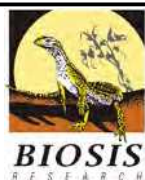
HLA ENSR (2007) *Aboriginal Heritage Assessment: Camden Gas Project Stage 2 Concept Plan Spring Farm and Menangle Park Project Areas*. An unpublished report for AGL Gas Production (Camden) Pty Ltd

Navin Officer Heritage Consultants Pty Ltd (2008) *Mount Annan, NSW 66kV Overhead Lines Cultural Heritage Assessment*. An unpublished report for Integral Energy

Figures



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8 Tate St
WOLLONGONG
NEW SOUTH WALES 2500

Figure 1: Location of the Study Area in a regional context.

Date: 21 October 2009

Checked by: RBR

File number: S5682

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Scale:

0 0.5 1.0 1.5 2.0
kilometres



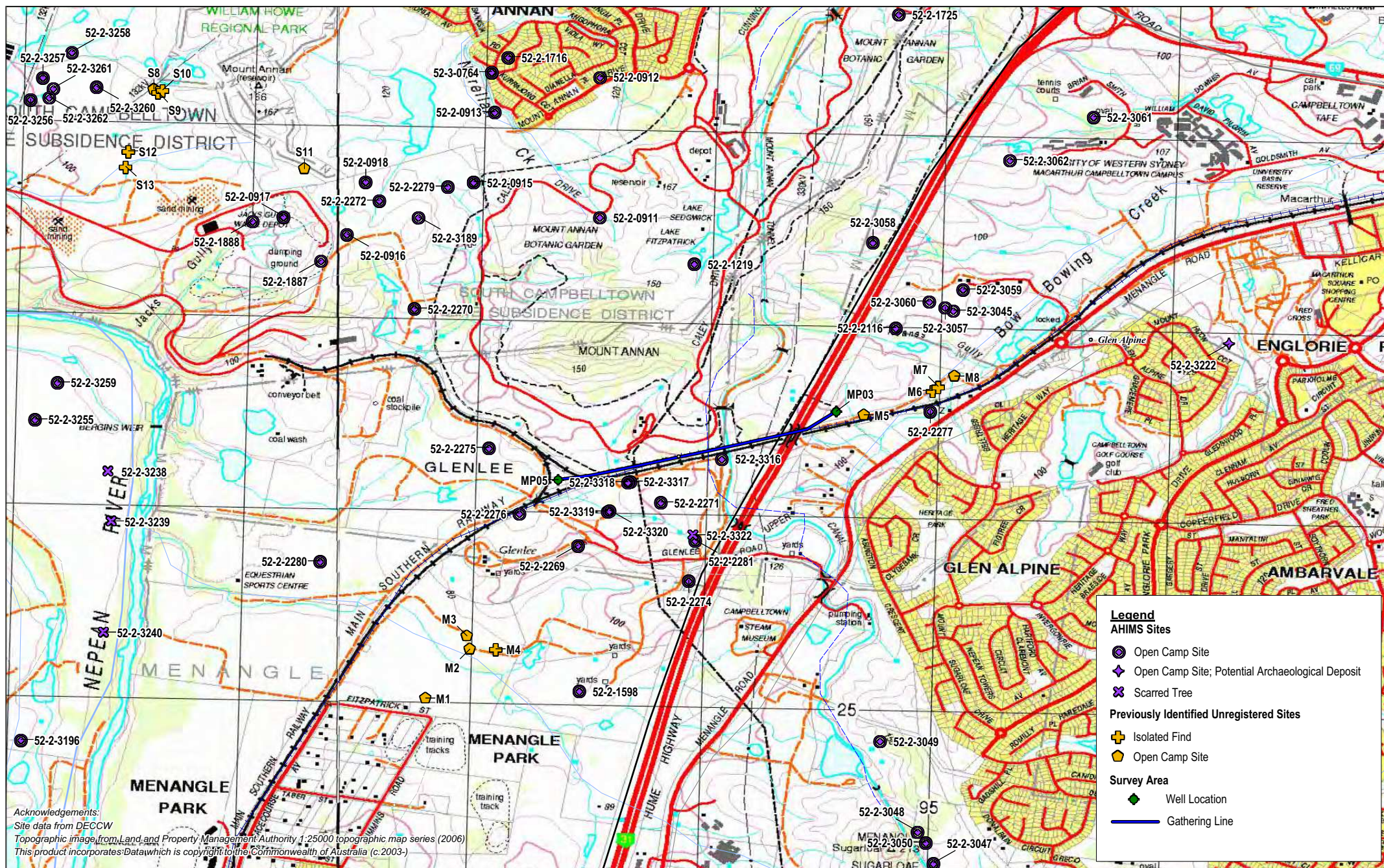


Figure 2: Aboriginal sites located within 2km of the proposed gas gathering line replacement

Figure 2: Aboriginal sites located within 2km of the proposed gas gathering line replacement

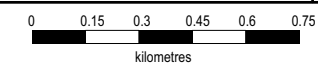
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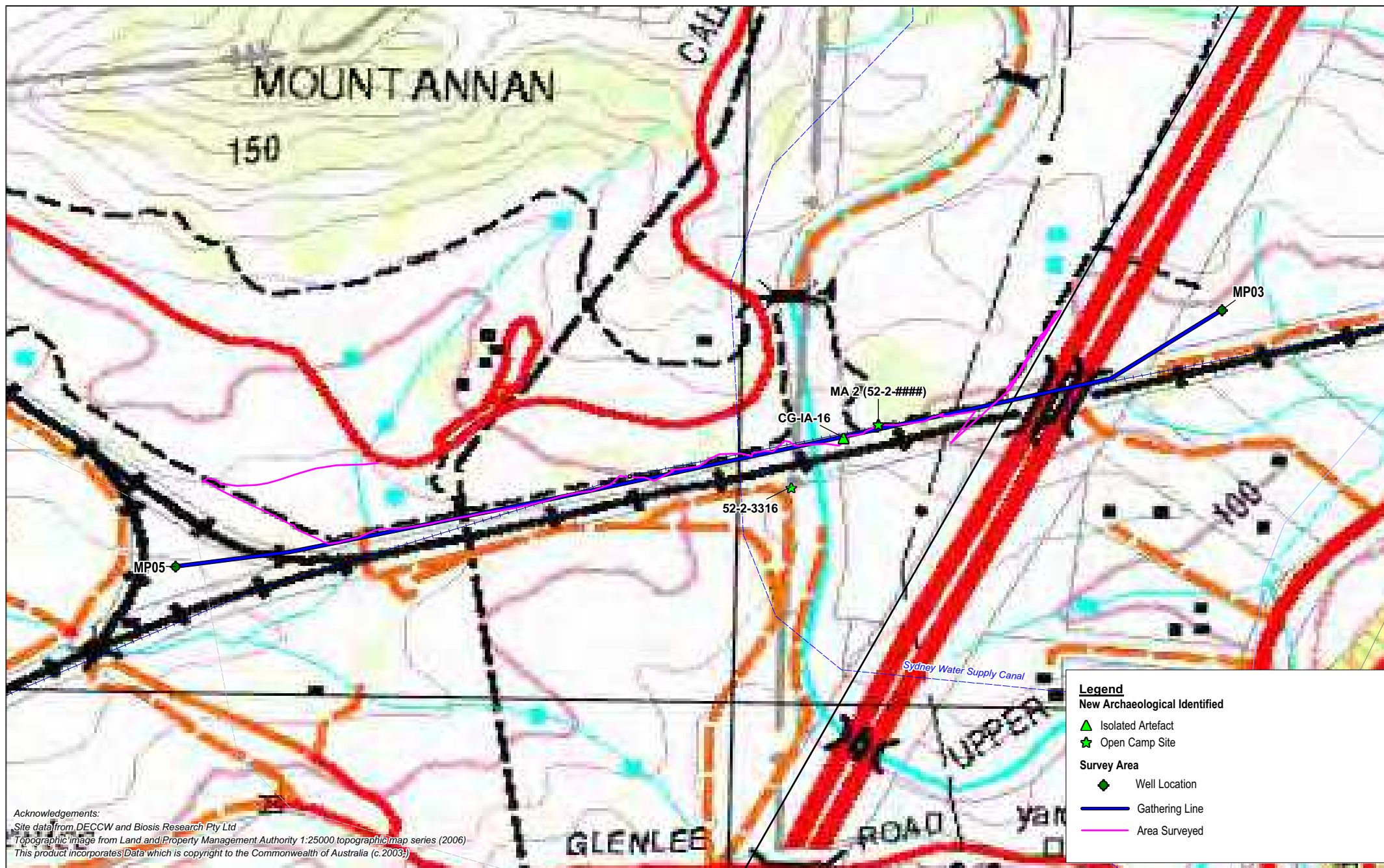
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Scale:



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Figure 3: Area surveyed and new Aboriginal archaeological sites identified

Date: 21 October 2009

Checked by: RBR

File number: S5682

Location P:\5000\5600s\5682\Mapping\S5682 F3 New Sites.WOR

Scale:

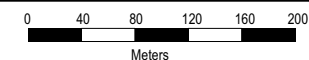


Figure 3: Area surveyed and new Aboriginal archaeological sites identified

