Bulk Water Alliance

Murrumbidgee to Googong Water Transfer - Terrestrial Ecology Management Plan

BWA-M2G-EN-ECP-007-2

January 2012

securing **water** for life

Certificate of approval for issue of documents

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Abbreviations

Abbreviation	
ACTEW	ACTEW Corporation Limited
ACTPLA	ACT Planning and Land Authority
AEMP	Aquatic Ecology Management Plan
AQMP	Air Quality Management Plan
BWA	Bulk Water Alliance
CEMP	Construction Environment Management Plan
CESM	Community Engagement and Stakeholder Management
CHOMP	Compensatory Habitat Offsets Management Plan
CMS	Construction Method Statement
ECP	Environmental Control Plan
EMP	Ecological Monitoring Sub Plan
EMS	Environmental Management System
EPA NSW	NSW Environment Protection Authority
EPA ACT	ACT Environment Protection Authority
EPBC ACT 1999	*Environmental Protection and Biodiversity Conservation ACT 1999*
ESCP	Erosion and Sediment Control Plan
HLPS	High Lift Pump Station
IRMP	Incident Response Management Plan
LALC	Local Aboriginal Land Council
LLPS	Low Lift Pump Station
M2G	Murrumbidgee to Googong
NVMP	Noise and Vibration Management Plan
OEMP	Operation Environmental Management Plan
PCL	Parks, Conservation and Lands
PER	Public Environment Report
POEO	NSW *Protection of the Environment Operations ACT 1997*
RAO's	Representative Aboriginal Organisations

Abbreviation	
SAD	Sensitive Area Diagram
SEP	Site Environmental Plan
SWMP	Soil and Water Management Plan
TEMP	Terrestrial Ecology Management Plan
WMP	Waste Management Plan

Environmental Commitments and Conditions of Approval

Table 1.1 M2G EIS Commitments

Reference Document	Commitment	Reference within TEMP
EIS Condition 17	Detailed design of the pipeline will ensure the pipeline is constructed in the identified construction impact zone in order to minimise direct impact on moderate to good quality Box Gum Grassy Woodland, grasslands and hollow-bearing trees and rock outcrops, and any other higher quality vegetation, as far as practicable.	Section 5 and Appendix A of this plan
EIS Condition 18	The construction and scour widths will be reduced in areas that contain EEC's and/or threatened species habitat. The exact location and extent of reduced construction corridor widths will be determined in the CEMP.	Section 5, Appendix A of this plan and Sensitive Area Diagrams
EIS Condition 19	Where the removal of hollow-bearing trees and/or hollow limbs is unavoidable, an appropriately qualified arborist will be employed. Tree hollows will be inspected for resident fauna by a qualified ecologist/zoologist prior to felling or trimming. Any trees or limbs that are removed will be retained on site for ground based habitat.	Section 5 and Appendix B of this plan
EIS Condition C20	A flora and fauna management sub-plan will be prepared as part of the CEMP, outlining the procedures to manage and minimise the potential for impact to terrestrial ecology.	This plan
EIS Condition C21	Offsets for the removal and/or modification of approximately 16.7 ha of native vegetation, including 11.1 ha of box gum grassy woodland (and secondary grassland) that ranges from poor to good condition, 1.7 ha of natural temperate grassland and 0.3 ha of snow gum grassy woodland occurring within the construction footprint, will be provided.	Section 5 of this plan and CHOMP
EIS Condition 35	Clearing of the pipeline corridor will be minimised where practicable to the extent necessary for construction of the pipeline and will not exceed the 40 m construction corridor. Where the alignment passes through areas of good quality remanent vegetation the construction corridor will be reduced and the area of disturbance restricted to a narrow band (down to 15 m). Clearance activities will be conducted in accordance with specific work method statements that will be developed as part of the CEMP.	Section 5, Appendix A of this plan and Sensitive Area Diagrams
EIS Condition 36	The pipeline construction process will restore native topsoil so that following construction the site alignment can be rehabilitated, with impacted flora restored to original condition. Topsoil will be stockpiled along the alignment and spread in accordance with the rehabilitation plan.	Section 5 of this plan and LRMP

Table 1.2 M2G Ministerial Conditions of Approval (NSW)

Reference Document	Commitments	Reference within TEMP
Ecological Impacts - Terrestrial		
Condition 2.6	In regards to the Endangered Purple Pea, *Swainsona recta* the Proponent shall: a) avoid and protect the identified population of the species during construction of the crossing at the Goulburn to Cooma railway line; b) submit to the Director-General and DECCW, as part of the Construction Environmental Management Plan required under Construction 6.2, a pre-construction survey of all potentially suitable habitats along the pipeline easement. The survey shall be conducted during the species flowering period; and c) minimise impacts to any population identified during the surveying described in b), through detailed design and alignment refinements.	Section 5 & Ecological Monitoring Plan Pre-Clearance Survey (Appendix E)
Condition 2.7	The pipeline easement width shall be reduced to the minimum feasible width in areas along the easement that are known to contain endangered ecological communities and/or threatened species habitat. Details regarding the extent and location of these reductions shall be included in the Construction Environment Management Plan contained in condition 6.2.	Section 5
Condition 2.8	Any clearing of native vegetation, native grassland, particularly Box Gum Grassy Woodland and rocky outcrops during construction of the pipeline shall be limited to the minimum feasible extent.	Section 5

<table>
<tr><th>Reference Document</th><th>Commitments</th><th>Reference within TEMP</th></tr>
<tr><td>Condition 2.9</td><td>Areas specified in Table 1 that are expected to be cleared shall be offset utilising the compensatory habitat offset package described in documentation represented by Condition 1.1 c). The package located on the Williamsdale Property in the Australian Capital Territory shall be implemented prior to commissioning of the project. The package shall offset in perpetuity the value of habitat lost as a result of the project. A final review of the compensatory habitat offset package shall be provided to the Director-General in the Operation Environment Management Plan. This version shall:
a) demonstrate the implementation of the offset;
b) describe how the offset shall be guaranteed and monitored in perpetuity; and
c) demonstrate a post construction review has been undertaken that confirms the extent of clearing was not greater than predicted. If clearing was greater, then the package shall demonstrate how the offset was modified and increased to the value of the actual habitat lost.
Table 1 – Habitat Areas expected to be cleared
<table>
<tr><th>Endangered Ecological Community Habitat</th><th>Native Vegetation (Hectares)</th></tr>
<tr><td>Box Gum Grassy Woodland</td><td>11.1</td></tr>
<tr><td>Natural Temperate Grassland</td><td>1.7</td></tr>
<tr><td>Snow Gum Grassy Woodland</td><td>0.3</td></tr>
<tr><td>Other Native Vegetation</td><td>3.6</td></tr>
<tr><td>Total</td><td>16.7</td></tr>
</table></td><td>Section 4.2 and 5.1 of this plan and refer to Compensatory Habitat Offset Management Plan (CHOMP)</td></tr>
<tr><td>Condition 2.10</td><td>After construction is complete and for a period of two years after that time (or as otherwise required by the Director-General) the Proponent shall monitor areas along the project alignment, for weed infestation. Any infestations shall be actively managed to remove or minimise their spread.</td><td>Section 8 of this plan</td></tr>
<tr><td colspan="2">Ecological Monitoring</td><td></td></tr>
<tr><td>Condition 3.3</td><td>Prior to the commencement of construction the Proponent shall prepare and implement an Ecological Monitoring Program to monitor the impact of the project on the ecology that may be impacted by the proposal. The program shall be developed in consultation with the DECCW and Department of Industry and Investment NSW and shall include but not necessarily be limited to:
a) set out monitoring requirements as detailed in the documents referred to in Condition 1.1 c), in order to assess the impact of the project on Ecology present along the easement and at Burra Creek at the pipeline outlet location and downstream including the Googong Reservoir;
b) baseline monitoring prior to the introduction of flows through Burra Creek in order to establish any ecological changes resulting from the project;
c) provisions for monitoring trench areas for any native fauna impacts likely to result from this work. Any native fauna found in the open trench shall be recorded and managed in consultation with DECCW;
d) provisions for monitoring during construction, operational and non-operational</td><td>Section 8 of this plan and the Ecological Monitoring Plan.</td></tr>
</table>

Reference Document	Commitments	Reference within TEMP
	phases; e) mechanisms for immediately investigating any anomalous monitoring results; f) mechanisms for the management and mitigation of any impacts on the waterways including cessation of flows where necessary; and g) details of how the monitoring results will be reported to the Director-General and the DECCW and the Department of Industry and Investment. The Program shall be submitted for the approval of the Director-General no later than one month prior to the commencement of construction, or within such period otherwise agreed by the Director-General, accompanied by evidence that the DECCW has been consulted regarding the Program. Construction shall not commence until written approval has been received from the Director-General.	
Environmental Management		
Condition 6.3 b)	As part of the Construction Environmental Management Plan required under Condition 6.2 of this approval, the Proponent shall prepare and implement a **Flora and Fauna Management Plan** to outline measures to protect and minimise loss of terrestrial and aquatic native vegetation and native fauna habitat as a result of construction of the project. The Plan shall include but not necessarily be limited to:	This Plan & Aquatic Ecology Management Plan (AEMP)
6.3 b) i	i. plans showing terrestrial vegetation communities; important flora and fauna habitat areas; locations where threatened species such as the *Swainsona recta*, Pink-tailed Worm Lizard and Rosenberg's Goanna as well as iconic species such as the Platypus, have been recorded or are likely to occur; and areas to be cleared. The plans shall also identify vegetation adjoining the site where this contains important habitat areas and/or threatened species, populations or ecological communities;	Section 4.2 and 4.3, 5 of this plan, Site Environmental Plans (SEP's)
6.3 b) ii	ii. methods to manage impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, such as location of fencing, procedures for clearing of vegetation or soil and procedures for re-locating hollows or installing nest boxes;	Section 5 & Appendix B of this plan
6.3 b) iii	iii. rehabilitation details and a program for reporting on the effectiveness of flora and fauna management measures, including a schedule for planting and seeding within areas supporting Endangered Ecological Communities. Management methods shall be reviewed where found to be ineffective.	Section 5 of this plan, Landscape Rehabilitation Management Plan (LRMP).

Table 1.3 M2G DA Notice of Decision - Conditions of Approval (ACT)

Reference Document	Commitments	Reference within TEMP
B20	That during the month of October, and prior to works commencing within the parts of the pipeline east of the Monaro Highway, the applicant shall survey the area subject to works for the pipeline within Block 119 District of Tuggeranong to determine the exact location of any *Swainsona recta* plants.	Section 5 and Appendix E of this plan
C2	The applicant must take all reasonable steps and precautions to avoid disturbance of all *Swainsona recta* plants and habitat within the site.	Section 5 of this plan
C3	In the case it is not possible to avoid disturbing the *Swainsona recta* and nearby habitat the applicant must, prior to disturbing them, develop an offset strategy to mitigate the impacts on this species. The strategy must include research into the best methods for translocation, the translocation of the effected plants, and re-establishment of these plants within an appropriate location to the satisfaction of the Conservator.	Section 4.2.2 of this plan
C7	That the following requirements shall be initiated and maintained for the duration of the works in accordance with the Landscape and Rehabilitation Management Plan required at Condition B11, to the satisfaction of PCL, TAMS:	Landscape Rehabilitation Management Plan
C7 a)	(a) The existing vegetation (trees, shrubs and grass) located on the verge and unleased Territory land immediately adjacent to the development will be managed, protected and maintained.	Section 5 of this plan
C7 c)	(c) The management and/or removal of native vegetation and exotic vegetation.	Section 5 of this plan
C8	The following requirements shall be initiated and maintained for the duration of the works in accordance with the plans required under Conditions B15, B16 & B17, to the satisfaction of the Senior Manager, AA, TAMS:	
C8 c)	(c) The all existing vegetation (trees, shrubs and grass) located on the verge and unleased Territory land immediately adjacent to the development is managed, protected and maintained in accordance with the LMMP.	Landscape Management Protection Plan (LMPP)

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1 Introduction

1.1 Background

The Murrumbidgee to Googong (M2G) Water Transfer is one of the recommended options for delivering improved security to the water supply for the ACT and region. It involves pumping water from the Murrumbidgee River (within the ACT) and transferring it via a pipeline to Burra Creek (in NSW), from where it would flow for approximately 13km to the Googong Reservoir.

The potential for significant impacts on terrestrial flora and fauna as a consequence of delivering the project will arise due to vegetation removal, pipeline excavation and other construction activities associated with the upper and lower pump stations.

Project activities can also affect local watercourses and will therefore also be addressed in the Soil and Water Management Plan (SWMP) as well as the Aquatic Ecology Management Plan (AEMP). These activities include earthworks, construction and blasting activities in or near watercourses.

The Bulk Water Alliance (BWA) has identified the following significant areas of interest with regards to the management of terrestrial flora and fauna within the construction area of the M2G:

- the BWA is aware that the M2G pipeline route and surrounding areas supports important habitat for various threatened species. As a result construction activities must be conducted in a manner which minimises potential adverse impacts to threatened species in the development area.
- the BWA acknowledges that the M2G pipeline route has significant numbers of weed species that require management in accordance with PCL and NSW Department of Parks and Wildlife Service objectives.

Effective management and mitigation strategies are critical to minimising the potential for significant impacts to native flora and fauna, and in particular, listed threatened species. In order to effectively manage the above matters and other potential ecological issues associated with the pipeline construction, This Terrestrial Ecology Management Plan (TEMP) has been prepared to:

- identify potential risks to terrestrial flora and fauna values associated with construction activities;
- detail proposed mitigation measures and strategies to manage identified risks;
- detail proposed environmental monitoring programs and inspection regimes; and
- detail compliance monitoring and auditing schedules.

This plan has also been designed to address client expectations and requirements, and adequately address risks and stakeholder concerns. The BWA is committed to providing the services it offers in a manner that conforms to the contractual requirements and to all relevant regulatory and legislative requirements.

The BWA will ensure that the controls are properly implemented and are regularly monitored and audited to assess their effectiveness. Changes to the stipulated controls will be instigated if they are not achieving their objectives.

The project comprises of the following key features:

Table 1.4 Key features of the M2G Project

Infrastructure	Description
Intake/low lift pump station	The intake/low lift pump station will comprise a concrete box structure built into the riverbank. The low lift pump station will include a screen, grit collection and removal, pumps and valves and filtration to prevent fish transfer.
High lift pump station	The pump station will pump water to a high point at Gibraltar Range, from where it will run under gravity to the discharge point. The high lift pump station will consist of a building enclosing a pump hall and electrical services and an amenities area.
Pipeline	The pipeline will transfer the water from the low lift pump station to the high lift pump station, then onto the outlet structure. It will be constructed of 1016 mm

Infrastructure	Description
	diameter steel pipe. The pipeline will be approximately 12 km long, with the pipe located approximately 1.8 m to 4 m below ground level. Air valves and scour valves will be located at regular intervals along the pipeline to provide pressure relief and to allow cleaning.
Outlet structure	The outlet structure will take the form of a weir box arrangement located on the bank of Burra Creek. It will comprise a rectangular concrete box approximately 12 m along the creek bank with a 250 mm grated opening along the west bank of Burra Creek. Water will flow into the weir box from the pipeline and will discharge over the weir and run down the creek bank to the creek, which flows to Googong Reservoir. This method of discharge is designed to minimise scouring of the creek bed near the outlet.
Electric power supply	The electrical infrastructure will comprise a 132 kV/11 kV substation in Williamsdale and a single 11 kV cable to the high lift pump station.
Mini-hydro power generator	Electricity provided by the grid will be supplemented by electricity generated by a mini-hydro electric power facility which will be constructed as part of the project.

1.2 Purpose and Scope of the TEMP

The purpose of developing and implementing this TEMP is to ensure the effective management and mitigation of potential impacts to native terrestrial flora and fauna as a consequence of delivering the M2G project. Mitigation measures to manage impacts will be implemented through this TEMP.

This TEMP specifically addresses the methods, techniques and timing (in relation to each construction phase from pre-clearance surveys, clearing and grubbing, trench excavation activities etc) for mitigating impacts on terrestrial flora and fauna as a consequence of the construction activities. It incorporates the recommendations contained within the EIS for ecological impact mitigation requirements within the construction boundary. This TEMP also addresses how the construction and future operation will be monitored to ensure that the objectives of this plan and the commitments of the EIS have been achieved.

This TEMP does not specifically address the actions/methods for implementing biodiversity offsets as stated in the EIS recommendations as a result of the proposed clearing and inundation of the pipeline other than to note that biodiversity offsets will be provided and a comment on the extent and nature of the offset to be provided. For further details on the offsets strategy, refer to the Compensatory Habitat and Offsets Management Plan (CHOMP).

1.3 Objectives of the TEMP

This Plan provides a framework for procedures and techniques to ensure that the Bulk Water Alliance will establish management, mitigation and protection measures to minimise the potential for (significant) impacts on native terrestrial flora and fauna. The objectives of the TEMP are:

- to document terrestrial ecology impact mitigation methods and techniques to be adopted in the construction of the M2G pipeline corridor;
- to document commitments raised in the Murrumbidgee to Googong Water Transfer Environmental Impact Statement (EIS) relating to terrestrial ecology;
- to describe how the practical measures and best management practices will be implemented to prevent or mitigate potential impacts relating to terrestrial flora and fauna
- to outline the roles and responsibilities of those involved in the design and implementation of terrestrial ecology management actions;
- to minimise or prevent the degradation of terrestrial habitats for all native species from the processes of construction;

- to ensure threatened species within the pipeline route are not significantly impacted as a result of construction activities;
- to ensure existing ecological assets are protected wherever possible and the impact of construction activities on areas of native vegetation, particularly endangered ecological communities and threatened species are minimised;
- to carry out rehabilitation of impacted areas/habitats within the construction footprint through an extensive revegetation program utilising appropriate indigenous species propagated from locally collected reproductive material;
- to assess terrestrial flora and fauna condition prior to, during, and after construction. This includes the preparation and implementation of an effective monitoring, auditing and reporting framework to assess the effectiveness of the controls implemented. This will involve an organised, integrated and systematic approach to effectively address and monitor terrestrial ecology impacts during the term of the project;
- to go beyond a culture of business as usual (compliance) by demonstrating excellence in ecological management; and
- to comply with ACT, NSW and Commonwealth legislative requirements for conservation and reinstatement of native vegetation communities.

1.4 Performance goals

The performance goals of this TEMP are:

- to manage (limit/mitigate) impacts on the ecology of the surrounding environment, particularly direct impacts on threatened species and their habitats through the application of best management practices and innovation;
- all members of threatened species to be protected through management actions including identification of presence/habitat areas, relocation of members where necessary, pre-construction clearance, prevention of entering construction areas (fencing) where appropriate;
- work areas will be kept to the minimum area necessary for safe working operations to minimise exposed surfaces; and,
- rehabilitate disturbed areas and provision of habitat offsets as required.

2 Legislative & Regulatory Compliance

2.1 Relevant Legislation

The BWA will comply with all legislation, Conditions of Approval, permits, guidelines and standards relevant to the project activities.

Table 2.1 Legislation

Legislative Jurisdiction	Relevant Act
Commonwealth	*Environmental Protection and Biodiversity Conservation Act 1999*
Territory (ACT)	*Nature Conservation Act 1980* *Environment Protection Act 1997* *Fisheries Act 2000* *Pest Plants and Animals Act 2005* *Water Resources Act 2007*
New South Wales	*Environmental Planning and Assessment Act 1979* and *Amendment 2008* *Protection of the Environment Operations Act (POEO Act) 1997* *Fisheries Act 1935* *Fisheries Management Act (1994)* and *Amendment 2009* *Water Management Act (2000)* *Noxious Weeds Act 1993* *Catchment Management Authorities Act 2003* *Native Vegetation Act 2003*

2.2 Guideline and Standards

The key reference materials relevant to management of terrestrial flora and fauna during design and construction of the M2G project include:

- ACT Code of Forest Practice, August 2005, Version 1;
- *Environment Protection Guidelines for the Preparation of an Environment Management Plan*, Environment Protection Authority, ACT, August 2007;
- *Environment Protection Guidelines for Construction and Land Development in the ACT*, Environment Protection Authority, ACT, August 2007;
- Florabank Native Seed Collection Code of Practice, Greening Australia NSW, 1999;
- Preparation of Environmental Management Plan Guidelines (DIPNR 2004);
- Florabank Guidelines, *Model Code of Practice for Community Based Collectors and Suppliers of Native Seed*, 1998;
- Sharp, Dorrough, Rehwinkel, Eddy and Breckwoldt, 2005, *Grassy Ecosystems Management Kit: A Guide to Developing Conservation Management Plans*. Environment ACT, Canberra;
- Langford, Simpson, Garden, Eddy, Keys, Rehwinkel and Johnston, 2004, *Managing Native Pastures for Agriculture and Conservation*, NSW Department of Primary Industries;
- Eddy D, 2002, *Managing Native Grassland: a guide to management for conservation, production and landscape protection*, WWF Australia, Sydney;
- Bennett E, 2005, *Management of native grasses in the urban landscape*, Native Grass Resource Group Inc., Adelaide;
- AS 4970 – 2009 Protection of Trees on Development Sites.

2.3 Conditions of Approval

The CoA's for the Project are detailed in **Tables 1.1, 1.2 and 1.3** of this document and in Appendix A of the CEMP. Where a specific condition of approval or commitment has been documented, this has been listed with a reference to where this document or other EMP documents addresses this specific condition.

2.4 Licences & Permits

Tables 2.2 and **2.3** identify the approvals, permits and licences relevant to terrestrial flora and fauna that are required for the project.

Table 2.2 Approval Requirements for NSW

Approval Required	Relevant Legislation	Authority
Environment Protection Licence	*Protection of Environment Operations Act. 1997*	Department of Environment, Climate Change & Water (DECCW)
Wildlife Licence	*National Parks and Wildlife Act 1979*	National Parks and Wildlife Service

Table 2.3 Approval Requirements for the ACT

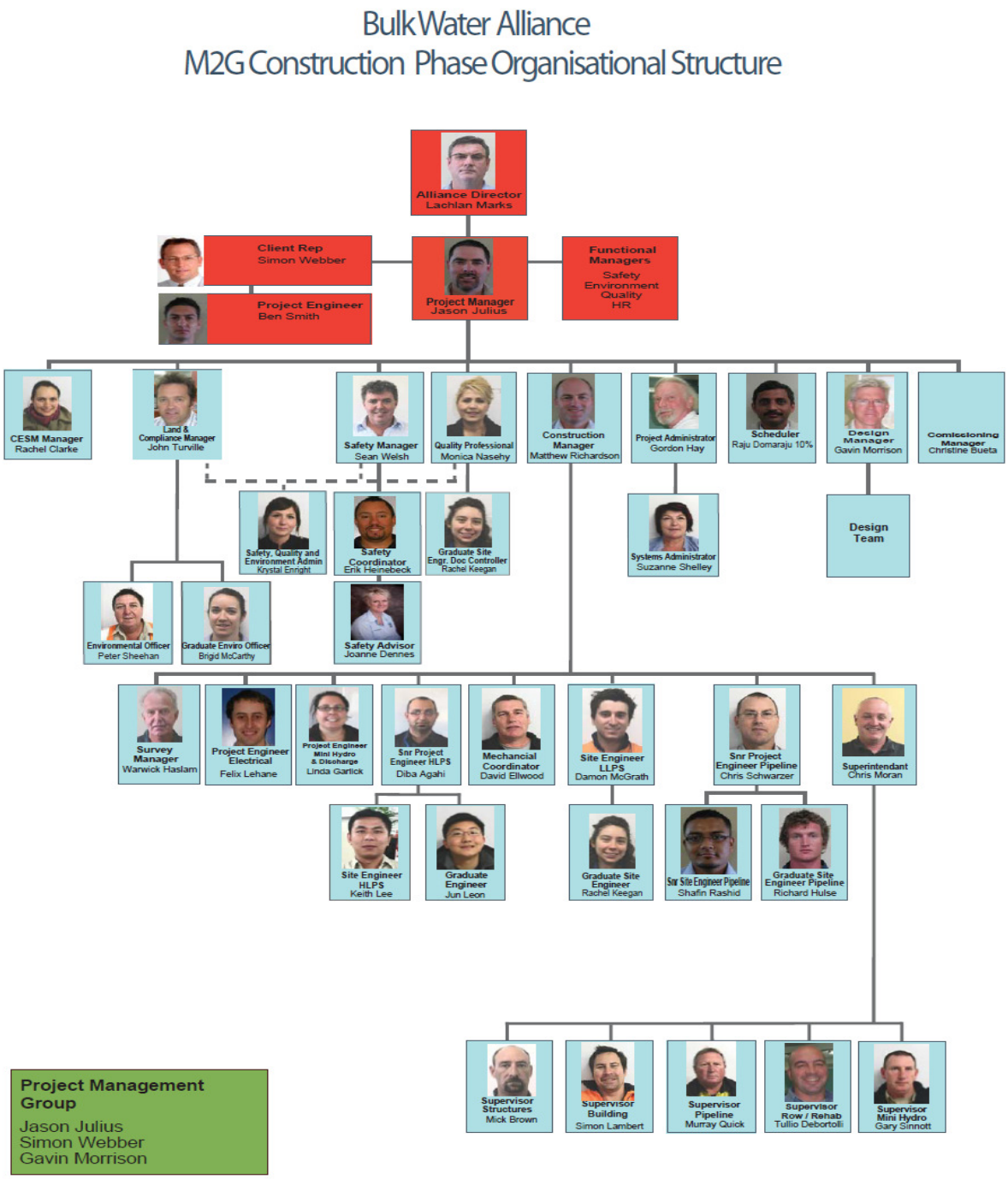
Approval required	Relevant Legislation	Authority
Licence to Take (Native Seed)	*Nature Conservation Act 1980*	Parks, Conservation and Lands (TAMS)
Licence to Take (Native Plants)	*Nature Conservation Act 1980*	Parks, Conservation and Lands (TAMS)
Licence to Take (Native Animals)	*Nature Conservation Act 1980*	Parks, Conservation and Lands (TAMS)
Environment Authorisation	*Environmental Protection Act 1997*	DECCEW (Environment Protection Authority)
Water Extraction Exemption Licence	*Water Resources Act 2007*	DECCEW (Water Resources Unit)
Waterway Works Licence	*Water Resources Act 2007*	DECCEW (Water Resources Unit)

3 Structure and Responsibilities

3.1 Site Structure

The project structure and responsibilities of site personnel are detailed in the M2G Organisation Chart Figure 3.1 below.

Figure 3.1 Murrumbidgee to Googong Management Hierarchy



3.2 M2G Project Manager

The M2G Project Manager has the role of ensuring that the project is delivered on time, within budget and is consistent with the aims and objectives of the Bulk Water Alliance. This role is accountable for all aspects of the project including safety, environment and heritage, quality, budget and deliverables.

3.3 M2G Construction Manager

The M2G Construction Manager is responsible for delivery of the construction phase of the Project to ensure that impacts are minimised and obligations are met. The M2G Construction Manager will be working with the M2G Environmental Manager to ensure that the Bulk Water Alliance's prescribed environmental outcomes are achieved.

3.4 M2G Land and Compliance Manager and Environmental Officer

The M2G Land and Compliance Manager has primary on-site responsibility for managing all aspects of environmental management and compliance for the construction and rehabilitation phase of the project.

The key responsibilities of the M2G Land and Compliance Manager and Environmental Officer will be to:

- Liaise with government agencies and relevant stakeholders regarding the implementation of this TEMP;
- Provide a regular construction program identifying critical construction activities;
- Monitor the construction activities in consultation with the relevant Consultant Ecologist (see below) to ensure that the TEMP is being appropriately implemented and that the objectives of the plan are being achieved.
- Monitor the revegetation activities within the project site in consultation with the relevant Landscape Manager.
- Implementation of weed management activities outlined in the Weed Management Strategy (Appendix D of this LRMP);
- Relocation/translocation of threatened species/significant species;
- Liaise with Construction Manager and Ecologist for scheduling of the clearing and grubbing.
- If required, coordinate seed collection activities in consultation with Parks, Conservation and Lands (PCL);
- Organise nursery contractors to germinate and grow native plants for planting within the M2G project;
- Coordinate direct seeding and planting contractors to implement the Landscape Rehabilitation Management Plan; and
- Coordinate contracts for the maintenance of Landscape initiatives.

3.5 Specialist Resources

Consultant Ecologist

A qualified ecologist and licensed by EPA under the National Parks and Wildlife Act 1974, will be engaged by the BWA to assist the project with the development, implementation and review of all mitigation measures implemented during the construction phase. The project ecologist will be responsible for the following:

- Provide specialised input any advice during the planning and construction phases with regards to managing terrestrial biodiversity values on site;
- Assist with the development of Construction Method Statements (CMS') for specific activities which require a higher degree of specialised input;
- Prior to construction identify and possible habitat trees that will require monitoring during clearing and grubbing phases of the project
- Monitoring construction activities, particularly during the clearing and grubbing phases of the project, to ensure compliance with approval conditions;
- Educating and advising construction staff on biodiversity related issues such as protection of biodiversity values, fauna relocation, revegetation initiatives and, if applicable, translocation of threatened species;

- Contribute to the overall management of potential and actual biodiversity impacts during the construction phase of the M2G project; and
- Support the M2G Environmental Management Team in ongoing monitoring and improvement of controls relating to the management of terrestrial biodiversity on site.

Subcontractors

Specialist subcontractors will be engaged to assist with the implementation of this TEMP. These will be managed by the M2G Land and Compliance Manager and will include (but not be limited) to the following:

- Seed collection contractors;
- Consulting Ecologist;
- Weed management contractors;
- Landscape (revegetation) contractors;
- Nursery (Plant Supply) contractors;
- Direct seeding contractors;
- Specialist Landscape Rehabilitation consultants.

3.6 M2G Community Engagement & Stakeholder Manager

The M2G Community Engagement & Stakeholder Manager has primary on-site responsibility for managing all aspects of community and stakeholder communication. Such activities include:

- Consulting with landholders, the community and other stakeholders and provide them with feedback;
- Reporting on community and stakeholder feedback to M2G managers;
- Managing community complaints and coordinate a response.
- Documenting community and stakeholder consultation and feedback.
- Developing and implementing the Construction Community and Engagement Stakeholder Management Plan (CESM Plan) and its procedures.

4 Environmental Aspects and Impacts

The following section describes the physical characteristics of the site and discusses the potential impacts on those aspects of the (local) environment as a consequence of the construction of the M2G pipeline project.

4.1 Environmental Aspects and Impacts

Environmental aspects as referred to in this document are those activities associated with the project that have the potential to cause, or result in, adverse environmental impacts. Due to the complexity of the project, it is conceivable that various aspects of the project would carry a varying degree of environmental risk which needs to be managed accordingly.

Effective environmental management should be proactive rather than reactive. In order to facilitate a proactive style of environmental management, a risk management style of assessment has been utilised to identify and assess environmental aspects associated with the project, and to implement appropriate mitigation strategies to minimise the likelihood of environmental risks associated with each aspect. This process involves:

1. Identifying the risk/aspect
2. Analysing the risk/aspect (determining likelihood and consequence)
3. Evaluating the risk/aspect
4. Treating the risk

All identified aspects are assessed based on the risk assessment matrix (Table 4.1). Risk assessment is based on (1) the likelihood of an impact occurring as a result of the aspect; and (2) the consequences of the impact if the event occurred. Following this assessment, each impact is assigned a risk category which ranges from “low” (low likelihood and consequence) to “extreme” (high likelihood and consequence). Table 4.2 describes each level of risk.

A risk category identified as having an extreme or high risk (a significant impact) may be downgraded if appropriate environmental controls and measures are implemented and maintained. Proactive planning, installation and maintenance of appropriate environmental controls and ongoing monitoring will reduce the risks associated with each environmental impact identified for the project. Table 4.3 details the environmental aspects identified for the project, the initial risk category prior to appropriate management strategies, the proposed management strategy and a revised risk category.

Table 4.1 Risk Scoring Matrix

		Consequences				
	Likelihood	1	2	3	4	5
		Negligible discharge (IMPACT)	Uncontrolled Discharges in MINOR quantities (IMPACT)	Moderate Impact/ breach of environmental Statutes	Major Impact/ breach of environmental statutes	Shutdown of project due to Environmental breach
A	Almost Certain	H	H	E	E	E
B	Likely	M	H	H	E	E
C	Moderate	L	M	H	E	E
D	Unlikely	L	L	M	H	E
E	Rare	L	L	M	H	H

Table 4.2 Risk Definition and Classification – Qualitative Measures and Likelihood Scale

Level	Categorisation Of likelihood	Description
A	Almost certain	Is expected to occur during the project, 90% or > probability
B	Likely	Will probably occur during the project, ~50% probability
C	Moderate	Might occur at sometime during the project, ~10% probability
D	Unlikely	Could occur at some time during the project, ~1% probability
E	Rare	Only occur in exceptional circumstances, < 1% probability

4.1.2 Assessment of Impacts on Terrestrial Flora and Fauna

The key aspects of the project that could result in adverse impacts on terrestrial flora and fauna include:

- Vegetation clearing and removal of hollows (habitat for native fauna);
- Removal and/or disturbance to rocks (known and potential habitat for the Pink-tailed Worm Lizard as well as other reptiles)
- Construction of ancillary structures and access tracks;
- Construction of waterway crossings (riparian vegetation and removal of possible fauna movement corridors);
- Rehabilitation/re-vegetation of disturbed areas not as successful as anticipated.

Impacts arising from construction may include:

- Loss of habitat value and biodiversity;
- Reduced plant numbers and diversity;

- Damage to riparian areas and wildlife corridors;
- Direct mortality and injury to fauna;
- Weed infestation;
- Damage or death of individual habitat trees due to physical impacts such as compaction of roots or machinery accidentally hitting or scraping tree trunks damaging vascular tissue or knocking them over.

The specific construction activities to be conducted and their subsequent potential impact on the ecological values of the site as well as the possible risk level and proposed mitigation measures are summarised in Table 4.3 below.

Table 4.3 Identified ecological impacts associated with the M2G pipeline project

Activity	Aspect	Potential Impact	Risk Category [1]	Mitigation Measures (refer to Table 5.1)	Revised Risk Category
Vegetation Clearing & Topsoil Stripping	Over clearing of vegetation.	• Loss of vegetation and biodiversity values • Direct mortality and injury to terrestrial fauna • Impacts on threatened species and their habitats • Spread of weed material offsite or into weed free areas.	Medium	1, 2, 3, 4, 11, 12, 14, 15	Low
	Transportation of noxious weeds.	Propagation of invasive weeds offsite and in weed free areas.	High	6, 7, 17	Low
	Deterioration of topsoil quality due to inappropriate stockpiling techniques.	Unsuccessful revegetation.	Low	5, 12, 13, 16, 17, 18, 21, 29	Low
	The inappropriate stockpiling of material (overburden, topsoil etc).	Impact on native vegetation through compaction of roots and direct damage to understorey vegetation.	Medium	12, 16, 17, 21	Low
	Chemical / Fuel spills and leaks.	Contamination of the natural environment, in particular native flora and fauna.	High	28	Medium
Bulk Earthworks	Exposure of large areas of loose material susceptible to erosion.	• Sedimentation of local waterways leading to impacts on terrestrial biodiversity. • Impacts to terrestrial biodiversity due to root damage, improper stockpiling adjacent to vegetated areas or fauna habitat • Impacts on terrestrial flora and fauna as a result of smothering habitats and including increased dust levels	High	3, 4, 11, 12, 13, 16, 17, 18, 19, 21, 27, 29	Medium

[1] *For Risk Categories, refer to Risk Matrix, BWA Workplace Risk Assessment BWA-2F-30—3A*

Activity	Aspect	Potential Impact	Risk Category [1]	Mitigation Measures (refer to Table 5.1)	Revised Risk Category
Construction Phase - General	Construction activities (site preparation/bulk earthworks/site offices/coffer dam installation/pipeline excavation etc).	Impact on health of terrestrial ecological community	Medium	1 – 29 and Environmental Work Method Statements	Low
	Chemical / Fuel spills and leaks.	Contamination of the natural environment	High	28	Medium
	Fencing of vegetation	Impact to native flora and fauna through inadvertent clearing.	Medium	1, 2, 4, 5, 8, 11, 12, 14, 15, 21, 22, 25, 26	Low
Rehabilitation and Decommissioning	Slow implementation of rehabilitation activities.	Loss of or reduced biodiversity and habitat values	Medium	13, 17, 18, 19, 21, 27, 29	Low
	Failed rehabilitation attempts.	Loss of or reduced biodiversity and habitat values	Medium	13, 18, 19, 27, 29	Low
	Weed management	Loss of or reduced biodiversity and habitat values	Medium	6, 7, 17, 27, 29	Low

4.2 Project Description and Physical Characteristics

4.2.1 Vegetation Communities within the M2G Pipeline Route

The following vegetation communities follow those identified by Biosis Research in their Ecological Assessment Report for the M2G pipeline (Biosis Research, March, 2009), and is included as Chapter 13 of the M2G Environmental Impact Statement (EIS). A vegetation condition assessment was undertaken by Ecoligical Australia during February 2011 (Appendix F). The vegetation communities are:

- Natural Temperate Grassland;
- Box Gum Grassy Woodland;
- Dry Sclerophyll Woodland – other native vegetation;
- Snow Gum Grassy Woodland; and
- Non-native vegetation (mainly exotic pastures).

The mapped extent of each community within the development site is summarised in Table 4.5 below.

Natural Temperate Grassland

Small patches of Natural Temperate Grassland occur on the lower slopes in the western portion of the study area (in the ACT). Minor components may also occur south of Williamsdale Road though it is possible that these areas were once treed and formed part of a woodland/grassland mosaic.

Native Woodland

Native Woodland is a broad vegetation mapping type and includes the following three native vegetation communities:

- Box Gum Grassy Woodland
- Dry Sclerophyll Woodland
- Snow Gum Grassy Woodland

The Box Gum Woodland community is protected under separate legislation for each jurisdiction.

Table 4.4 Classification of the Box Gum Woodland EEC.

Act	Classification	Criteria
Commonwealth ***Environment Protection and Biodiversity Conservation Act 1999***	White Box – Yellow Box - Red Gum Grassy Woodland and Derived Native Grassland: A Critically Endangered Ecological Community	Minimum thresholds: • Is or did have an overstorey of requisite tree species; • Has a predominantly native understorey; • Patch greater than 0.1ha; and, • Contains twelve or more native understorey species (excluding grasses)
NSW ***Threatened Species Conservation Act 1995***	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland EEC	In NSW, lower thresholds or categories apply. For example, modified sites composed of one main tree species (e.g. *Eucalyptus melliodora*) in various forms, or even treeless, with ground layers that are predominantly composed of exotic species with remnant grassy ground layers and some forbs may be sufficient.
ACT ***Nature Conservation Act 1908***	Yellow Box/Red Gum Grassy Woodland EEC	According to the ACT Action Plan No. 27 (ACT Government 2004b) the Box Gum Grassy Woodland community may be partially or moderately modified and still meet the definition, whereas substantially or severely modified woodland would not.

Non-native Vegetation

Non-native vegetation is a broad vegetation category and includes the following vegetation communities as identified and mapped by Biosis Research:

- Non-native – consists of planted pasture grasses
- Non-native trees – introduced and invasive trees including poplars, pines and willows
- Non-native vegetation – exotic/weed dominated, consists of introduced weeds and other exotic shrub and ground cover vegetation

The vegetation within these areas is of little conservation significance and no requirements are in place to protect or maintain these vegetation types. The exotic/weed dominated sites may however have some value to existing land users as pasture crops for livestock, although in general they are of little merit in terms of native species habitat value.

Table 4.5 Vegetation communities and estimated areas of impact

VEGETATION TYPE	AREA
Box Gum Grassy Woodland	11.34 ha
Natural Temperate Grassland	1.3 ha
Snow Gum Grassy Woodland	0.04 ha
Other Native Vegetation*	4.76 ha
Non-native vegetation	23.8 ha
Total Native Vegetation (Habitat Areas)	**17.44 ha**
TOTAL AREA	**41.24 ha**

*- other native vegetation includes native pastures, Kunzea/Acacia shrubland and *Eucalyptus bridgesiana – E. dives – E. mannifera* woodland.

The extent of each community subject to potential impacts identified in Table 4.5 above provides the basis for the type and extent of rehabilitation to be undertaken post-construction and the total extent of the biodiversity offset package to be provided. The biodiversity offset package and the rehabilitation of the site post-construction are dealt with separately and in more detail in the Landscape Rehabilitation Management

4.2.2 Significant Terrestrial Flora

Three plant species listed under the *EPBC Act 1999*, the *NSW Threatened Species Act 1995* or the ACT *Nature Conservation Act 1980* are known to occur locally, having been recorded during the field surveys.

Table 4.6 List of threatened flora occurring in the M2G transfer pipeline route.

Species	CW EPBC Act	NSW TSC Act	ACT NC Act	Known Occurrences	Habitat within the Study Area
***Leucochrysum albicans* var. *tricolor* (Hoary Sunray)**	E	-	-	Common on roadside reserves and lightly grazed paddocks within the study area. Previously recorded in the locality.	Yes
***Swainsona recta* (Small Purple-pea)**	E	E	E	Known within the Goulburn-Cooma Railway corridor between Royalla and Williamsdale. Also at Mt Taylor in the ACT. Recorded at Burra Creek during this survey, assumed to be a new record.	Yes
***Swainsona sericea* (Silky Swainson's Pea)**	-	V	-	Previously recorded in locality. Widely recorded within the study area west of Gibraltar Hill and Burra Creek.	Yes

In addition to the species listed in Table 4.6, an additional fourth species of conservation significance was recorded within the study area, this being *Discaria pubescens* (Hairy Anchor Plant) a ROTAP[2] listed species. Records of this species were made east of the Angle Crossing and Burra Creek area. The locations within the site where the above significant species have been recorded are shown in Figure 4.2 below.

A detailed survey for *Swainsona recta* is being prepared and will be undertaken from mid September to mid October, 2010 (dependant on flowering season) prior to construction commencing in relevant areas (refer to Appendix E of this plan). This survey will be undertaken as a component of the pre-clearance survey work with the view to surveying and locating all individual specimens occurring within the construction area. The potential management action(s) to be taken for *Swainsona recta* as part of this plan includes the following (options):

- recorded specimens will be fenced off and protected from construction impacts wherever possible;
- if required and possible, the pipeline will be assessed for either micro or macro realignments (subject to engineering and cost feasibility);
- assess the potential for translocation of specimens to outside of the construction area; and/or
- ACTEW will provide funding and other impetus into propagation programs with suitable organisations.

The final decision on which of the above options will be implemented will be based on outcomes of the detailed surveys to be completed in October 2010 and in consultation with ACT, NSW and Commonwealth agencies.

[2] *ROTAP – Rare Or Threatened Australian Plants: Briggs, J.D. and Leigh, J.H. (1995); Rare or Threatened Australian Plants, Revised Edition, CSIRO Publishing, Australia*

Other additional flora surveys will also be conducted pre-construction. These include the location and marking with tape of all hollow-bearing trees (see Section 5.2 for further details) as well as confirming the areas subject to wombat and platypus habitat (burrows).

4.3 Significant Terrestrial Fauna

A total of eight threatened animal species were identified within the study area, namely:

- Pink Tailed Worm Lizard – *Aprasia parapulchella* (NC Act, TSC Act, EPBC Act)
- Gang Gang Cockatoo – *Callocephalon fimbriatum* (TSC Act)
- Speckled Warbler – *Pyrrholaemus saggitatus* (TSC Act)
- Diamond Firetail – *Stagonopleura guttata* (TSC Act)
- White-winged Triller – *Lalage sueurii* (NC Act)
- Varied Sitella – *Daphoenositta chrysoptera* (NC Act and proposed listing TSC Act)
- Large footed Myotis – *Myotis macropus* (TSC Act), and
- Eastern Bent-wing Bat – *Miniopterus schreibersii oceanensis* (TSC Act)
- Eastern False Pipistrelle - *Falsistrellus tasmaniensis* (TSC Act)

The locations within the site where the above significant species were recorded are shown in Figure 4.3.

4.4 Other Important Terrestrial Fauna

A number of other terrestrial fauna groups were also recorded or are previously known from within the study area and which may be affected by the project. These include the Short-beaked Echidna *Tachyglossus aculeatus*, Common Brush-tail Possum *Trichosurus vulpecula*, Sugar Glider *Petaurus breviceps*, *Rattus* sp., *Antechinus* sp., Common Dunnart *Sminthopsis murina* and microbats (such as the Gould's Wattled Bat *Chalinolobus gouldii* and White-striped Freetail Bat *Tadarida australis*). Larger ground-dwelling mammals were also observed, specifically, the Common Wombat *Vombatus ursinus*, Eastern Grey Kangaroo *Macropus giganteus* and Wallaroo *M. robustus.*

Of particular relevance to the pre-clearance surveys from the above list of animals, numerous wombat diggings and burrows were observed within the riparian zones along the Murrumbidgee River and Burra Creek. Additionally the Water Rat *Hydromys chrysogaster* and Platypus *Ornithorhynchus anatinus* whilst not directly observed, may be expected to occur within permanent river systems including the Murrumbidgee River (ACT Government 2007c; ACT Government 2007b). Kangaroos are also known to occur within the area and may be temporarily affected by the project.

Impact mitigation strategies for these fauna groups are discussed in Section 5 of this management plan.

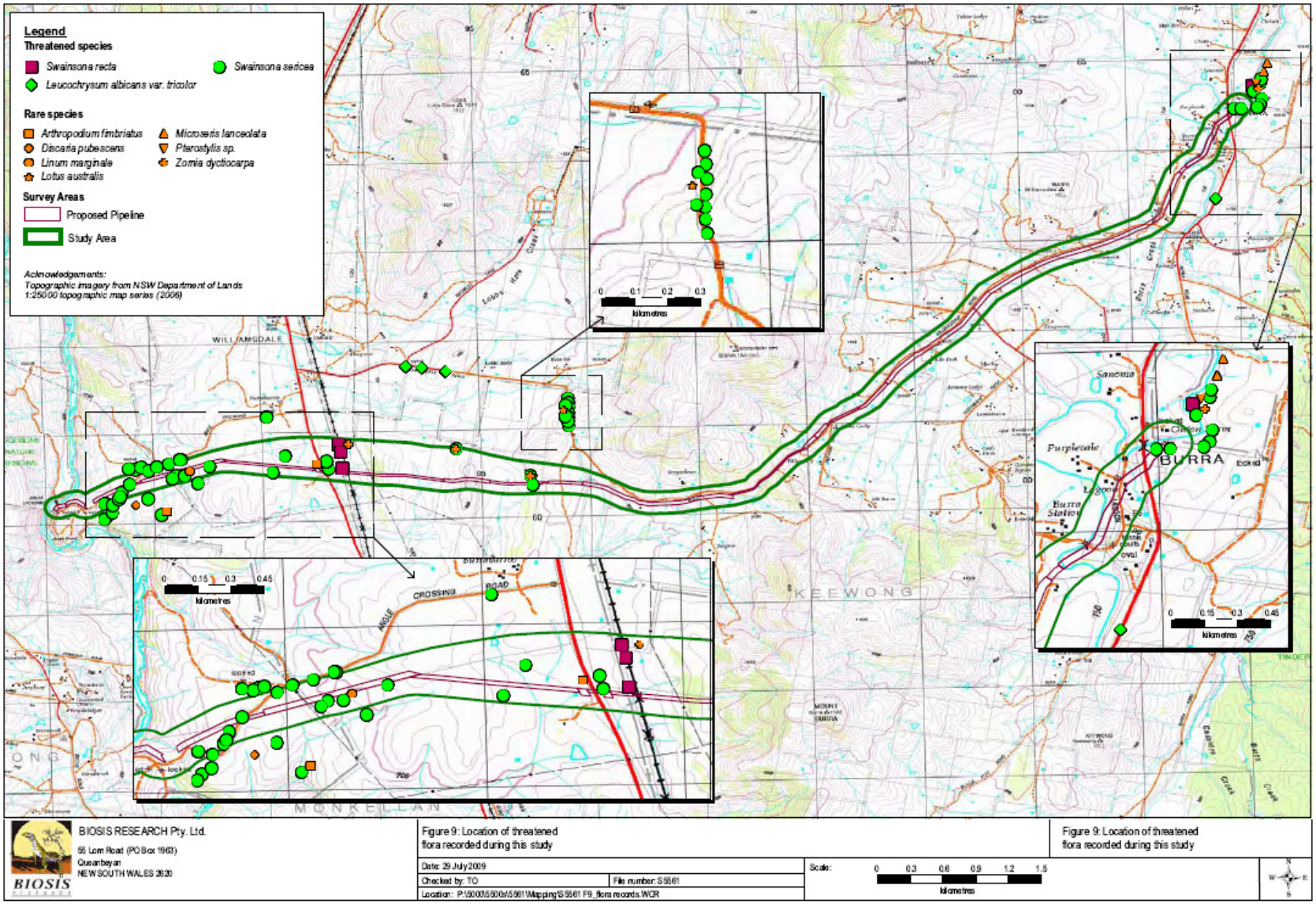


Figure 4.1 Records of Threatened or ROTAP Plant Species within the study area

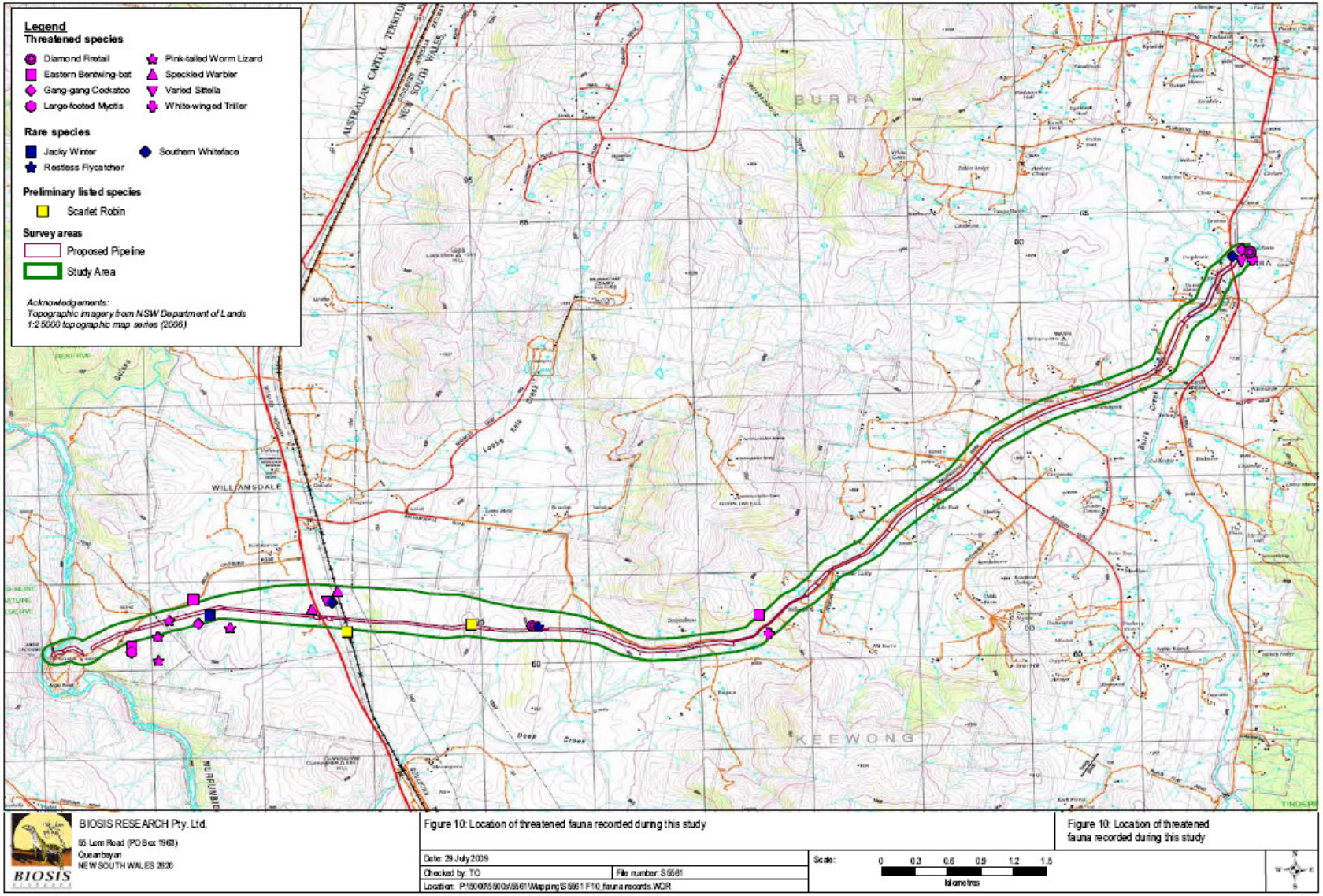


Figure 4.2 Records of Threatened or Rare Fauna within the study area.

5 Environmental Control Measures

The implementation of various environmental control measures during the course of construction can reduce the risk category of environmental aspects associated with the project (i.e. controlling the risk). In addition to implementing “best management practices” on site, the following environmental control measures will be implemented on site to minimise impacts on terrestrial flora and fauna associated with construction activities.

5.1 Mitigation Measures

The following table identifies the general and specific mitigation measures to be implemented to minimise the impacts on terrestrial flora and fauna.

Environmental Work Method Statements (EWMS) and relevant toolbox talks will be prepared for specific activities to minimise the risks to terrestrial flora and fauna associated with the project.

Sensitive area diagrams have been prepared in conjunction with the Site Environment Plans (SEP). The sensitive area diagrams will include locations of all sensitive receptors, such as threatened species and trees to be retained and the corridor widths in relation to sensitive areas. These will be distributed for display in site compounds and provided to the superintendant and relevant construction personnel. The diagrams will also provide a visual, day to day management tool for on-site environmental personnel, auditors and regulatory agencies.

Table 5.1 Mitigation measures

Ref.	Mitigation Measure	Responsibility
1.	Accurately and clearly mark out the edge of clearing and trees/vegetation to be retained including hollow trees, significant species, and riparian zones (min 20m each side).	Supervisor Ecological Survey Team
2.	Prior to the commencement of construction activities, arrange an inspection of all habitat to be disturbed (using a qualified ecological and licenced specialist). Any fauna encountered during this pre-clearance survey should be removed if possible, or its shelter/nest site clearly marked so that an attempt can be made at a later/more suitable time to remove the fauna.	Environmental Team
3.	Wherever practical and feasible, locate ancillary structures such as site offices and sediment basins on previously cleared sites.	Design Team Soil conservationist
4.	Identify, retain and protect old or mature trees (alive or dead) which are in close proximity to the construction area by marking out/fencing. This is to be done in accordance with the procedures detailed in Section 5.2 of this report.	Ecologist Supervisor Environmental Officer
5.	Install all erosion and sediment control measures prior to clearing and grubbing and other construction activities and maintain throughout the construction period, to prevent potential impacts on any nearby offsite native vegetation and habitat areas.	Subcontractors Environmental Officer
6.	Install vehicle wash-down areas, if required, in accordance with the Weed Management Strategy to ensure weeds from the site are not transported outside of the site or into sensitive areas. Wash-down areas are to be located at entrances/exits to the construction site as well as between areas of high or low weed infestation within the site. Exact locations of wash-down will be shown clearly in the Site Environment Management Plans. Refer also to the Weed Management Strategy in the Landscape Rehabilitation	Design Team Supervisor Environmental Officer

Ref.	Mitigation Measure	Responsibility
	Management Plan.	
7.	Any noxious weeds in the vicinity of the development are to be removed and further controlled throughout the duration of construction.	Environmental Officers Subcontractors
8.	The ecologist will identify habitat trees and they will be scheduled for removal in sections. During removal of a section with identified habitat trees a licensed fauna spotter/catcher (handler) is to be present, specifically, must be available during the clearing of any large/hollow-bearing trees. The spotter/catcher is to inspect all large trees after felling to see if hollows are present that were not visible from the ground during the initial pre-clearance and hollow-bearing tree surveys. All hollows, once felled, are to be inspected in felled trees with the use of a torch. Should significant species be detected breeding in hollow bearing trees, these trees are to be retained until the breeding activity is complete. Refer to Environmental Work Method Statement, Clearing and Grubbing.	Environmental Officers Ecologist
9.	Cease work immediately if any previously unknown threatened flora or fauna species are encountered and contact PCL (TAMS, ACT Government) or DECCW immediately. Refer to the procedures in Section 5.4 on how rescued fauna is to be treated.	Ecologist Environmental Officer
10.	The pipeline trench and any other excavations that are left “open” for more than 24 hours are to be regularly inspected (each morning) to ensure that no animals have fallen into the trench and become trapped. Ideally, the ends of each section of trench will be battered to allow animals to climb out of the trench. If the trench section is greater than 150m in length, then at the end of each day, place a solid branch (at least every 50m) in the trench to allow trapped fauna to climb back out of the trench to escape, or, create an escape point in the excavated trench for fauna. Should fauna species be continually observed within the trenches left open overnight, then more secure measures will be taken to protect terrestrial species from becoming trapped within the trench.	Foreman Environmental Officer
11.	Limit native vegetation clearing to that required for construction and safety and, where possible, retain established trees and native shrub understorey.	Environmental Officer Foreman
12.	Ensure that all required fencing is carried out prior to any clearing works commencing and is done in such a way that minimal soil disturbance and impact on native vegetation occurs.	Environmental Officer Engineer/Superintendent
13.	Ensure that after felling, some timber is retained for: • dispersing onsite for coarse woody debris purposes; • use in Landscape Rehabilitation works; or, • use as timber windrows	Environmental Officer Engineer
14.	Avoid the removal of trees with hollows (alive or dead). Where removal cannot be avoided, maintain the tree intact (as far as possible) and place it on the ground in adjoining vegetation.	Project Engineer Environmental Officer
15.	Provide protection (fencing) around trees including their root zone wherever possible. Fencing should ideally be extended out to the	Environmental Officer Supervisor

Ref.	Mitigation Measure	Responsibility
	drip-line of the tree's canopy.	
16.	Clearly identifying stockpile and storage locations and provide erosion and sediment controls around these structures. Stockpiles are to be located away from drainage lines and vegetation to be retained.	Environmental Officer Engineer/Foremen
17.	Topsoil will be windrowed along the limit of clearing except in narrowed sections of the easement (i.e. sections that are 20m wide or less). Weed infested topsoil will be windrowed separately to weed free topsoil and will be marked as weed infested.	Supervisor Construction Manager
18.	Disturbed areas will be rehabilitated and/or landscaped as soon as practical, through a progressive landscaping regime to ensure stabilisation of bare areas and to take advantage of optimal growing conditions. This will be undertaken in accordance with the approved Landscape Rehabilitation Management Plan (LRMP).	Environmental Officer Construction Manager
19.	Revegetate and rehabilitate the construction area with locally indigenous plant species where appropriate or an approved pasture species in consultation with the landowner. The list of species to be used in the landscaping and rehabilitation is included in the Landscape Rehabilitation Management Plan.	Environmental Officer Subcontractors
20.	Relocate native fauna species from locations that need to be cleared and/or dewatered.	Environmental Officer Ecologist
21.	Toolbox and provide environmental training to personnel involved in clearing and grubbing as well as topsoil stripping operations.	Environmental Officer
22.	Plant machinery and vehicles driving/parking beyond the limit of clearing in unauthorised areas or under trees to be retained, is to be avoided. Toolbox training for staff and parking areas are to be provided and clearly identified.	Construction Manager
23.	Cease work immediately if any previously unknown threatened fauna species are encountered and consult Environmental Officers immediately to verify species identified. PCL, RSPCA or Wildcare would be consulted in relation to injured animals.	Environmental Officer
24.	If any snakes require removal from site, for areas in the ACT, Parks, Conservation and Lands (via Canberra Connect) or a licensed and qualified snake handler will be contacted to assist in removal of snake species. Refer to Section 5.4 of this plan.	Environmental Officer Supervisor/Leading Hand
25.	Undertake regular inspections to ensure sensitive areas are clearly marked and that barrier fencing is in place	Supervisor Environmental Officer
26.	Undertake inspections of fenced areas on a weekly basis to check their integrity	Environmental Officer
27.	Include appropriate native species in revegetation initiatives	Landscape Design Team
28.	Ensure fuels and chemicals are bunded and stored appropriately on site in accordance with ACT EPA and DECCW guidelines	Superintendent / Construction Managers
29.	Monitor rehabilitation activities in accordance with the objectives	Construction Manager /

Ref.	Mitigation Measure	Responsibility
	stated in the Landscape Rehabilitation Management Plan (LRMP)	Environmental Officer

5.2 Tree Hollow Management

Tree hollows provide a place to roost or a refuge for a range of fauna including many species of hollow-dependant woodland birds as well as gliders, possums, owls and bats. A wide range of mature hollow-bearing trees were recorded across the study area.

The project ecologist will identify where stag trees and hollow bearing trees exist within the construction footprint. Every effort will be made to avoid hollow bearing trees, where possible, in designing and constructing the project. All hollow-bearing trees (as well as other important vegetation) located within the pipeline corridor will therefore be accurately surveyed and clearly marked prior to construction commencing. Trees that are not directly impacted by construction activities (i.e. trees within the construction fence line but not located directly within the proposed trench excavation area for the pipeline) will be marked out for protection and retained.

The marking of individual trees and plants will be conducted as per the methods described in the Environmental Work Method Statement (EWMS) for Clearing and Grubbing and involves the use of Red marking tape for individual plants close to and adjoining the construction zone that are to be retained and not impacted on as a result of the construction activities and Yellow marking tape for individual trees that require the presence of the ecologist when felling. The survey and assessment of all hollow-bearing trees will also be performed in accordance with the methods included in the Hollows/Burrows Inspection Checklist (provided at Appendix D) and the M2G Tree Clearing Procedure (Appendix F).

The actual decision on retention of trees (and understorey vegetation) will be made by the M2G Construction Manager in consultation with the Ecologist and the M2G Land and Compliance Manager. The contractor engaged to undertake this work will be informed of this procedure.

Retained vegetation will be afforded adequate protection by being appropriately fenced-off, within the protective fencing to be established to an area beyond the tree's drip-line, wherever feasible.

Those trees which do require removal will be inspected for resident fauna prior to clearing (see pre-clearance survey protocols, below as well as the Hollow/Burrow Inspection Checklist at Appendix D). All reasonable attempts will be made to clear these trees as late in the day as possible to avoid disturbing/dislocating nocturnal fauna in the middle parts of the day and thus exposing them to too great a period of daylight without shelter. All hollows will be again inspected (with a torch) immediately after felling to ensure that no fauna are present in hollows that were missed by the original pre-clearance survey. Should significant species be detected breeding in hollow bearing trees, these trees are to be retained until the breeding activity is complete. Where practical, hollow bearing trees should be avoided during the spring season.

Once cleared either the entire tree or at the least the sections of the tree which are hollow, will be set-aside for relocation into designated areas to contribute toward habitat provisions for terrestrial fauna (Coarse Woody Debris).

5.3 Pre-clearance Surveys and Fauna Rescue Procedures

A local fauna specialist/project ecologist will undertake a pre-clearing assessment of all vegetation impacted by the proposed project with particular attention being paid to hollow bearing vegetation and nests as well as wombat burrows and any possible platypus burrows if/where encountered.

Hollow bearing trees will be systematically marked and recorded to determine their removal or retention as per the methodology provided in the Environmental Work Method Statement (EWMS) for Clearing and Grubbing, and as described above.

As part of the pre-clearance survey procedure, but not necessarily conducted at the same time as the bulk of pre-clearance surveys, a detailed survey for *Swainsona recta* will be conducted.

Where Endangered Ecological Communities (EECs) are encountered within the site but not directly affected by the pipeline excavation work, they will be fenced off for protection. The construction easement will be reduced wherever possible in areas that traverse NTG and BGGW to limit the impact on these communities.

Where areas of rocky outcrops are located within the construction corridor but not required to be removed from the trench excavation, stockpiling areas or Right-of-Way, these will be either fenced-off within the construction site or the construction site fencing to be narrowed to avoid these areas altogether. Suitable rocks in pipeline alignment that cannot be avoided and will be required to be removed, will be relocated into suitable areas outside the construction footprint to provide potential future additional habitat for reptiles, including potential habitat for the Pink-tailed Worm Lizard. The placement of rocks onto adjacent sites will be discussed between the landowner (for their consent), the M2G Environmental Manager and the Ecologist.

The locations and required protective fencing will be shown on the sensitive area diagrams for all relevant areas where there are hollow-bearing trees, areas of high conservation vegetation (e.g. Natural Temperate Grassland and Box-Gum Grassy Woodland) and rocky outcrops.

As mentioned, numerous wombat diggings and burrows were observed within the riparian zones along the Murrumbidgee River and Burra Creek. Measures will be taken to ensure the clearance or exclusion of wombats from burrows that will be inundated during level discharge. This is likely to include the inspection of burrows for occupancy. If unoccupied, the burrow would be "closed off" with branches and other material. If occupied, the burrow would have to be revisited regularly until the wombat had moved on and then the burrow closed. This may require repeated management action during the life of the project. The above actions will be undertaken in accordance with the requirements of the Hollow/Burrow Inspection Checklist (provided at Appendix C).

Following on from the pre-clearance survey, an ecologist will be present during the clearing and grubbing activities to monitor the presence of fauna, particularly threatened fauna species and in the removal of hollow bearing trees. Equipment for fauna rescue (hessian sack, gloves, and transport boxes) will be kept in designated locations for emergency use by site staff if required. The fauna specialist will carry a fauna rescue kit in a site vehicle, and an additional kit would be located in the site office. The pre-clearance surveys and fauna rescue procedures are also documented in the Clearing and Grubbing Environmental Work Method Statement (EWMS).

5.4 Rescued Fauna

If an injured, shocked or juvenile animal or eggs are discovered on the study site, including during activities associated with the relocation/removal of hollow-bearing trees, the following procedures will be followed:

- If fauna require handling, this will be done with care and by the licensed fauna specialist or an environmental officer will contact WIRES or Wildcare (ACT);
- For large animals, cover the animal with a towel or blanket to minimise stress and firmly but gently place it in a cardboard box, or natural fibre bag;
- For small animals, place in a cotton bag, tied at the top;
- Keep the animal in a quiet, warm, ventilated and dark place. A designated site for the release of fauna would be decided upon in advance of any construction work;
- If the animal is seriously injured and requires immediate attention, as determined by the fauna specialist, the rescue agency should be contacted immediately;
- If the fauna specialist is not present when an injured/juvenile animal is found, the rescue agency should be called immediately;
- If the animal does not require immediate attention, as determined by the fauna specialist, the rescue agency should be called in the afternoon and they would collect any animals requiring attention;

- If the animal is reluctant to move away or is injured, then it shouldn't be released and a fauna rescue agency should be contacted;
- Some animals require particular handling (e.g. venomous reptiles, raptors) and should not be handled by site personnel;
- If the animal cannot be handled, record the exact location of the animal and contact the rescue agency;
- Once the rescue agency arrives at the site, they would be responsible for the animal. Any decisions regarding the care of the animal would be made by the rescue agency; and
- If the rescue agency cannot be contacted, the fauna specialist would deliver the injured/captured animal to the agency as soon as practically possible.

The Environmental Representatives on site will hold the contact details of fauna rescue services and local veterinary surgeons. Contact details will be made readily available to site staff at all locations where clearing is to be undertaken. The contact numbers will be provided on the Site Environment Plans.

Identified local fauna rescue agencies and contacts are detailed in Table 4.

Table 5.2 Fauna Rescue Agencies

Name	Contact details
Parks, Conservation and Lands (TAMS) **Canberra Connect**	13 22 81
R.S.P.C.A. (ACT) **Branch Contact (injured Wildlife)**	6287 8113 (Business Hours) 0413 495 031 (After Hours)
Wildcare	6299 1966
WIRES - NSW	13000WIRES (1300 094 737)

5.5 Release Procedure

If the animal is not injured, it may be released nearby in an area that is not to be disturbed by construction in accordance with the following procedures:

- Prior to any clearing works, several sites within or near the project site would be identified as suitable release points by the ecologist;
- The fauna specialist or Environmental Officer would be responsible for undertaking any release;
- If the species is nocturnal, release would be carried out at dusk; and
- No release would take place during periods of heavy rainfall, unless the fauna specialist determines that the animal is too stressed to be held any longer.

5.6 Weed Management

Declared weeds under ACT and NSW legislation that occur within the site have been assessed and are described in the LRMP. Weeds within the site are managed in accordance with the Weed Management Strategy in the LRMP and the Site Environment Plans. Weed management actions include removal and poisoning of weed infested areas with subsequent rehabilitation through planting with appropriate species of

flora as well as measures to control weed spread including the use of vehicle wash-down areas at appropriate locations.

5.7 Landscape Rehabilitation

A Landscape Rehabilitation Management Plan (LRMP) has been developed to specifically detail how the construction activities and structures within or in proximity to sensitive areas would be appropriately designed and managed to ensure the integrity, function and condition of these areas are maintained and/or suitably rehabilitated.

The proposed landscape rehabilitation program is designed to help ameliorate the impact of the project on the environmental values of the area and to improve the condition of existing areas of depleted natural habitat.

This will be achieved by:

- Protecting and enhancing existing remnant vegetation, particularly Endangered Ecological Communities;
- Planting well designed blocks and corridors of indigenous species; and
- Managing weed populations

The LRMP includes details and action in relation to rehabilitation practices, soil management, establishment techniques (both for non-native and high conservation value areas), treatment of drainage lines and ephemeral water courses, sourcing of native seed, erosion control, maintenance regimes, protection of threatened species and improvement of terrestrial flora and fauna values.

Further details on ongoing monitoring of the effectiveness of landscape restoration works are provided in the LRMP and in the Ecological Monitoring sub-plan.

6 Communication & Consultation

6.1 Community Engagement and Stakeholder Management

Communication and training are key elements to effective environmental management on site. Ensuring that all site personnel are aware of their roles and responsibilities with respect to environmental aspects of the project not only assists in the implementation of management strategies on site, but more importantly increase environmental awareness among employees potentially leading to behavioural changes in common work practices.

All communication and consultation will be undertaken in accordance with the Community Engagement and Stakeholder Management (CESM) Plan – there will be one CESM Plan for Construction and then one dealing with Operational matters. The CESM Manager is responsible for the interface with the community. This includes (but is not limited to) notification of temporary road closures, community engagement regarding construction and the complaints process. The CESM Manager reports to the M2G Client Representative whilst working in conjunction with the M2G Project Manager, Superintendent, Environmental Manager, Safety Manager and Project Engineers.

In addition, consultation with government agencies will be undertaken regularly as described in the CEMP with the intention of reviewing the effectiveness of the TEMP, site management practices, monitoring results and any other relevant issues.

Table 6.1 Communication Network

Communication	
Project personnel including sub-contractors/suppliers	• A site induction and environmental training will be provided to all personnel and sub-contractors engaged to work on the site. • Feedback on environmental matters, new legislation etc. will be provided and encouraged. • Close communication will be maintained between the Construction Manager, M2G Environmental Manager, Foremen and Environmental Officer.
Government agencies	**ACT** • ACT EPA • Parks, Conservation and Lands (TAMS) • ACT Heritage Unit **NSW** • NSW EPA • Department of Planning (DoP) • Australian Rail Track Corporation (ARTC)
Community and Landholders	• Individual Landholders will be informed in advance of construction activity affecting them in accordance with the CESM Plan • Project information will be made available to the community in accordance with the CESM Plan through advertisements, community notices and newsletters. • A protocol for registering and responding to complaints will be established as detailed in the Complaints Management Procedure

Communication	
	and CESM Management Plan.

6.2 Complaints management strategy

The Bulk Water Alliance is committed to managing terrestrial flora and fauna related complaints from affected residents or stakeholders in a proactive and conciliatory manner.

Relevant community and stakeholder groups will be progressively informed of the various stages of construction by the Community Engagement and Stakeholder Management (CESM) team.

The community and stakeholder groups identified in the Construction CESM Plan will be informed of the duration of the works and they will be given an 1800 toll free number to contact the BWA CESM team should they wish to register a complaint regarding any aspect of the construction project.

The BWA CESM Manager will automatically implement a process for registering and responding to the lodged complaint as per the Complaints Management Procedure. The CESM Manager will report back to the project team on impact and mitigation effectiveness on a weekly basis.

The Water Security Hotline phone number (6248 3563) is available during business hours for general questions, project updates and to provide feedback. A toll free number (1800 211 242) is available 24 hours a day for emergencies. Complaints and comments can also be sent via email to watersecurity@actew.com.au. The toll free number for registering complaints will be available once construction commences.

7 Training, Awareness & Competence

Three main forms of training will be implemented on site:

- site induction;
- environmental management training; and
- “toolbox” training
- Information sheets in crib rooms, bathrooms, notice boards etc.

Records of all site inductions and on site training will be kept on a database, including details of the training topic(s) presented, participants and training dates. All participants will be required to “sign-off” that they have been informed and understand their environmental obligations at the conclusion of each training session.

Training will generally be prepared and delivered by the Environmental Officer, or by personnel delegated by the M2G Land and Compliance Manager.

7.1 Site Induction

Prior to working on site, all personnel and subcontractors will undertake a site induction detailing significant environmental and OHS requirements associated with the M2G project. This will include, but not be limited to, the following environmental components.

- The EMS and CEMP (purpose, objectives, etc) and the requirements of this TEMP;
- Legal requirements including due diligence, duty of care and potential consequences of infringements;
- Environmental responsibilities;
- Conditions of licences, permits and approvals;
- BWA policies (including the Shared Road Policy);
- Significant environmental issues and areas of the site, including the identification of project boundaries, location of refuse bins, washing, refuelling and maintenance of vehicles, plant and equipment;
- Environmental management techniques for key environmental elements (soil and water, waste and recycling, flora and fauna, heritage etc) e.g. EWMS;
- Incident management and emergency plans;
- Reporting process for environmental harm/incidents;
- Protection and maintenance of environmental controls; and
- BWA sustainability objectives.

7.2 Environmental Management Training

Targeted environmental management training will be provided to individuals responsible for environmental management on site, or groups who are undertaking activities which have been identified as “high risk”. This environmental training is designed to achieve a level of awareness and competence appropriate to their assigned activities.

Specific links will be made between environmental objectives and sustainability principles during training sessions (where possible). A comprehensive overview of sustainability may also need to be included (i.e. social, economic and environmental aspects, and inter-generational equity).

Of relevance to this TEMP, staff will be trained on responses to the presence of significant fauna within the construction site, working with the ecologist and/or fauna spotter/catcher, being aware of sensitive areas and other requirements such as weed removal from vehicles and machinery etc.

Records will be maintained on site of all training sessions conducted and personnel attendance. These records will be maintained by the Environmental Officer.

7.3 Toolbox Training

Toolbox training will help to ensure that relevant information is communicated to the workforce and that feedback can be provided on issues of interest or concern. Toolbox training will generally be prepared and delivered by the Project Engineers, Superintendent, Site Foreman and/or the Environmental Officer and will reflect risks and concerns associated with construction activities occurring on site.

EWMSs will draw reference to specific toolboxes based on risks associated with the proposed construction activity. The toolboxes will complement the TEMP by providing additional details on the management and mitigation of identified environmental impacts. Environmental toolbox training topics may include but are not limited to:

- Working within or in close proximity to waterways;
- Clearing and grubbing procedures;
- Concrete washout procedures;
- Dust control;
- Response to encounters with fauna, including injured fauna;
- Protecting waterways and riparian zones;
- Wastewater control;
- Spills and leaks (including the application of remediation products);
- Emergency response procedures;
- Wet weather procedures and inspections;
- Fauna rescue agencies and fauna management procedures
- Identified endangered fauna
- Changes to recent legislation; and
- Other general site issues.

8 Inspection, Auditing & Monitoring

8.1 Environmental Inspections

As outlined in the CEMP, environmental site inspections will take place on a regular basis to ensure appropriate mitigation measures and controls are implemented and that they are fully operational and effective. A variety of site inspections will be initiated for the project. These are described in Table 8.1 below:

Table 8.1 Flora and Fauna Inspection and Monitoring

Frequency	Inspection/Monitoring Activities	Delegated Responsibility
As required	Fauna pre-clearance survey of construction site.	Ecologist, Environmental Officer
As required	Inspections, where deemed necessary, of areas to be cleared to ensure environmental controls are being followed. Inspections to ensure no mortality of threatened fauna are occurring as a direct result of construction activities.	Ecologist, Environmental Officer
Daily	Inspection of trenches for trapped fauna	Foreman
Weekly	A general inspection of works.	Environmental Officer, Construction staff
	Inspections of vegetation protection areas & riparian zones by the Environmental Officers to check the integrity of protective fencing.	Environmental Officer
As required	Inspections of Habitat trees to check they are clearly marked, fencing is in place and no construction activities, soil removal or stock piling are occurring within their vicinity.	Ecologist, Environmental Officer
Ongoing	A Fauna Specialist will be present during vegetation clearing, including all activities associated with the management of habitat trees.	Ecologist, Environmental Officer
	A tree hollow inspection checklist would be completed by the Fauna Specialist for all removed/relocated trees.	Ecologist, Environmental Officer
	Monitoring of Threatened Species populations and habitat condition retained within the corridor	Ecologist, Environmental Officer
	Inspection for weed growth & infestation throughout the construction footprint.	Environmental Officer
	Design and implementation of landscaping and revegetation/rehabilitation works. Monitoring of the landscaping and rehabilitation works post construction is outside the Bulk Water Alliance scope of works. Post construction monitoring will be undertaken by ACTEW AGL as part of its ongoing monitoring program.	Environmental Manager, Landscape Architects ACTEW AGL representative.

8.2 Environmental Monitoring

The monitoring of the performance of terrestrial ecology management will be largely covered under this Terrestrial Ecology Management Plan and its overarching Construction EMP (CEMP). Following a period of 1 year on completion of the project, the monitoring of terrestrial ecology will transfer over to the Operational Environment Management Plan (OEMP) and its specific sub-plans.

With regard to Terrestrial flora and fauna, monitoring will include predominantly fauna injuries or death as a consequence of the project construction activities. The monitoring of flora would largely fall under the responsibility of the Landscape Rehabilitation Management Plan (LRMP) which includes the monitoring of rehabilitation performance and the management of weeds.

8.3 Auditing

Periodic audits of the TEMP are detailed within the CEMP Audit Schedule.

Audits will include:

- A full site inspection
- Compliance with legislative requirements and project approvals
- Compliance with this TEMP
- Full review of environmental records (e.g. checklist and inspections)
- Review of monitoring results
- Closure of non-conformances and previous audit findings
- An assessment of the suitability of the TEMP with regards to current construction activities. This may initiate a TEMP review/revision
- Recommendations for further improvements

8.4 Non-conformance, Preventative and Corrective Actions

8.4.1 Environmental Actions Lists and Improvement Notices

The M2G Land and Compliance Manager will issue Environmental Maintenance Observation and Action Lists (SQE Inspection/Site Instruction) or an Environmental Improvement Notice (EIN) as required. Environmental Maintenance Observation and Action Lists will be issued to the Superintendent and/or Foremen for deficiencies that are minor in nature but require rectification. An Environmental Improvement Notice (EIN) will be issued for more serious deficiencies which pose a greater level of environmental risk, or for when a reprimand is required for poor performance.

8.4.2 Resolving Non-conformances and implementing Corrective Actions

The process for managing environmental non-conformances will be as follows:

- When an environmental non-conformance is detected, the nature of the issue will be evaluated by the M2G Land and Compliance Manager and/or M2G Environmental Officer and the requirement for new or additional controls will be discussed to prevent reoccurrences. Corrective actions will subsequently be identified and entered into the Environmental Action Register (EAR) for reference. This EAR will detail the non-conformance, corrective and/or preventative action, timing and the personnel responsible for implementing the action. The non-conformance will remain “Open” until corrective actions have been implemented.
- Once the corrective action has been implemented, the EAR will be updated to “Closed” status with details of the closure date attached.

- The EAR will be reviewed regularly by the Environmental Team to ensure actions are being completed in a timely manner. Any issues arising from these reviews will be discussed between the M2G Environmental Manager and relevant construction personnel.

8.5 Environmental Records

The M2G Environmental Officer with the assistance of the M2G Land and Compliance Manager will maintain the following records:

- The TEMP;
- Relevant approvals, regulatory licences and permits;
- Inspection records and checklists;
- Environmental monitoring results and chain-of-custody forms;
- Environmental accident/incident/emergency reports;
- Environmental Non-conformance and EIN documentation;
- Audit reports;
- Management review minutes and action taken

Where hard copy records are provided they will be scanned and made available electronically. Each set of records will be allocated a register/index for easy reference and filing. Records will be maintained for at least 5 years after the date of final completion and will be available to ACTEW Representatives and Regulatory Agencies as required.

8.6 Document and Data Control

All environmental documentation associated with this management plan will be documented and maintained on site in accordance with "*document and data control"* requirements detailed in the CEMP.

9 Review and Improvement of the TEMP

The plan is designed as a practical guide for use during the construction phase of the project. This document is dynamic and if a non-conformance is detected in the plan, if project implementation methodology changes, or if mitigation measures improve, the TEMP will be revised so it remains effective in managing terrestrial ecological impacts arising from the project.

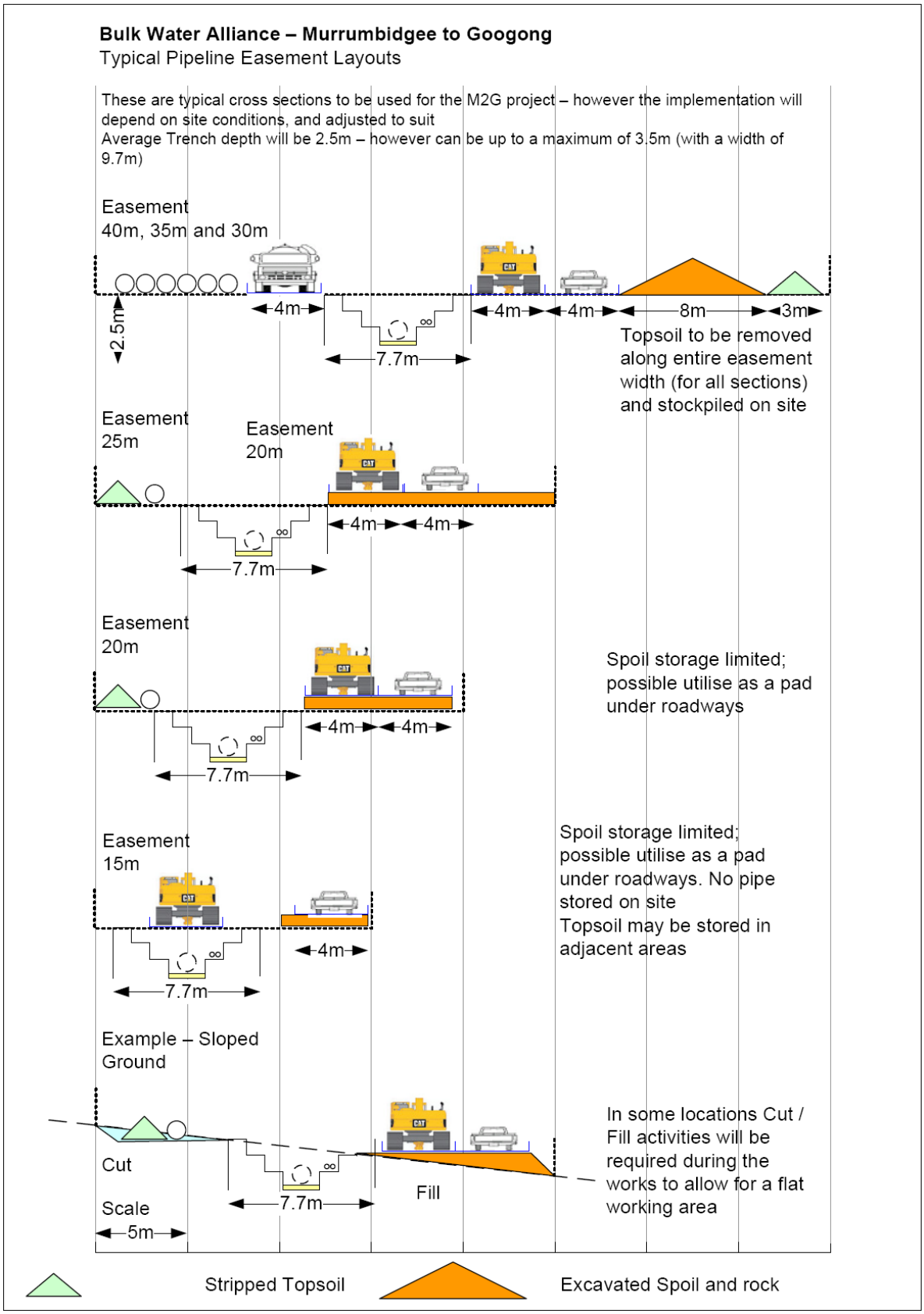
The outcomes of inspections, monitoring, audits and the completion of checklists will facilitate the identification of problems, recurring issues or areas for improvement. Where identified, the effectiveness of the TEMP will be reviewed and opportunities for improvement will be identified and discussed with site personnel.

A system for the review and improvement of the environmental management system is described within the CEMP.

Table 9.1 Register of Significant Changes to the TEMP

Reference	Amendment Required	Status
Distribution Copies	Names to be updated in the table.	Closed
Table 4.5	Areas of impacted native vegetation to be updated.	Closed
Section 4.3 and 4.4	Speckled Warbler – correct taxonomic name is *Pyrrholarmus saggitatus.* Move Eastern False Pipistrelle from 'Important' to 'Significant' list.	Closed

Appendix A **Typical Pipeline Easement Layouts**



Appendix B **Pre-clearance Fauna Survey Checklist**

ACTEW CORPORATION

BWA Environmental Form
Pre Clearing Checklist

Form: BWA-2-806C

Revision: 0

Logistical Information	
Project:	Date of Inspection:
Location:	Activity Occurring:
Tree Species:	Tree Number(s):
Person completing checklist:	

Pre Clearing Checklist			**Comments**
Boundary of clearing zone fenced?	Yes ☐	No ☐	
Has the Ecologist marked populations and/or individuals of threatened plants using the recognised colour coding protocol?	Yes ☐	No ☐	
Has Ecologist completed Pre-clearing surveys for Threatened Species	Yes ☐	No ☐	
Has the Ecologist marked habitats to be disturbed using the recognised colour coding protocol?	Yes ☐	No ☐	
If habitats have been marked, have they been cleared or if not is the ecologist present?	Yes ☐	No ☐	
Protective fencing installed around threatened ecological communities and vegetation to be retained?	Yes ☐	No ☐	
Protective fencing around termite mounds located within the works boundary?	Yes ☐	No ☐	
Has vegetation to be salvaged for re-use been identified?	Yes ☐	No ☐	
Mulching and chipping plant established?	Yes ☐	No ☐	
Have all residents adjoining the corridor been advised at least 5 days prior to clearing vegetation?	Yes ☐	No ☐	
Any other issues to add or delete from the checklist?	Yes ☐	No ☐	

ACTEW CORPORATION

BWA Environmental Form
Pre Clearing Checklist

Form: BWA-2-806C

Revision: 0

Location Diagram (or insert photograph or map)

Potential Environmental Hazards

Comment / Notes

Return to Environmental Representative for Electronic Filing on Completion			
Environmental Representative Signature:		Date:	

Appendix C **Hollows/Burrows Inspection Checklist**

ACTEW CORPORATION

BWA Environmental Form Hollow/Burrow Inspection Checklist

Form: BWA-2-806B

Revision: 1

Logistical Information	
Project:	Date of Inspection:
Location:	Activity Occurring:
Species:	Species Number(s):
Person completing checklist:	Position:

Hollows Checklist	**Yes**	**No**	**N/A**
Have the tree(s) been marked and identified?	Yes ☐	No ☐	N/A ☐
Number and size of hollows (small/medium/large):			
Fauna species inhabiting hollows (if identifiable)			
Fauna relocated or removed?	Yes ☐	No ☐	N/A ☐
Specific details:			
Injured/Deceased Fauna?	Injured ☐	Deceased ☐	N/A ☐
If so, was it a native species, or endangered or threatened?	Yes ☐	No ☐	N/A ☐
Specific Details/Comments: (E.g. Juvenile, Pregnant, Fauna rescue agency arrival time, Release location etc.)			

BWA Environmental Form Hollow/Burrow Inspection Checklist

Form: BWA-2-806B

Revision: 1

Burrows Checklist	Yes	No	N/A
Type of habitat i.e. burrow, rock scree etc.			
Fauna species inhabiting burrows (if identifiable)			
Species inhabiting burrow (if identifiable):			
Species relocated or removed	Yes ☐	No ☐	N/A ☐
Specific Details:			
Injured/Deceased Fauna?	Injured ☐	Deceased ☐	N/A ☐
If so, was it a native species, or endangered or threatened?	Yes ☐	No ☐	N/A ☐
Specific Details/Comments: (E.g. Juvenile, Pregnant, Fauna rescue agency arrival time, Release location etc.)			

BWA Environmental Form Hollow/Burrow Inspection Checklist

Form: BWA-2-806B

Revision: 1

Location Diagram (or insert photograph or map)

Potential Environmental Hazards

Comment / Notes

Sign Off			
Name:	**Position:**	**Date**	**Signature**
Return to Environmental Representative for Electronic Filing on Completion			
Name:	**Position:**	**Date**	**Signature**

Appendix D **Clearing and Grubbing Checklist**

ACTEW CORPORATION

BWA Environmental Form
Clearing & Grubbing Checklist

Form: BWA-2F-806A

Revision: 0

Logistical Information	
Project:	Date of Assessment:
Location:	Activity Occurring (circle): Clearing Grubbing
Meteorological Conditions:	Recent Rain (mm):
Person completing checklist:	

Control Measures			Comments
Are protected trees and vegetation marked with flagging tape/fenced?	Yes ☐	No ☐	
Is the boundary of clearing zone clearly delineated?	Yes ☐	No ☐	
Are erosion and sediment controls in place PRIOR to clearing works commencing?	Yes ☐	No ☐	
If clearing adjacent to waterways, have appropriate safeguards been implemented to protect against impacts on fish species? E.g. erosion & Sediment Controls	Yes ☐	No ☐	
Have fish been relocated from waterways in accordance with relevant license conditions?	Yes ☐	No ☐	
Have areas of weed infected topsoil been marked and/or removed for disposal?	Yes ☐	No ☐	
Has vegetation been checked for the presence of fauna?	Yes ☐	No ☐	
Have unsuitable stockpiles been identified for the permanent storage of weed infested topsoil?	Yes ☐	No ☐	
Are stockpiles located away from vegetation (root zone and canopy drip line)?	Yes ☐	No ☐	
Can cleared vegetation be used for erosion control?	Yes ☐	No ☐	

BWA Environmental Form
Clearing & Grubbing Checklist

Form: BWA-2F-806A

Revision: 0

Has cleared vegetation been retained for mulching or relocation as fauna habitat	Yes ☐	No ☐	
Are disturbed areas being progressively stabilized?	Yes ☐	No ☐	
Have habitat boxes been installed prior to clearing.	Yes ☐	No ☐	

Location Diagram (or insert photograph or map)

Potential Environmental Hazards

Comment / Notes

Return to Environmental Representative for Electronic Filing on Completion			
Environmental Representative Signature:		**Date:**	

Appendix E **Pre-Clearance Survey**

Murrumbidgee to Googong Pipeline

Pre-clearance Surveys

Prepared for
Bulk Water Alliance

November 2010




DOCUMENT TRACKING

ITEM	DETAIL
Project Name	M2G Pipeline Pre-clearance Surveys
Project Number	10CANECO-0006
Prepared by	MD, RB
Approved by	TK
Status	Final
Version Number	0.2
Last saved on	16 November 2010

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from the Bulk Water Alliance.

Contents

1 Executive Summary

Surveys in the proposed Murrumbidgee to Googong pipeline easement for threatened species, hollow bearing trees and wombat hollows were undertaken during September – October 2010 by Eco Logical Australia. This report provides ecological and mapped information on the location of *Swainsona recta*, Pink-tailed Worm Lizard and rocky outcrops (potential habitat for the species), hollow bearing trees and wombat burrows.

A total of 3 *Swainsona recta* individuals occur within or immediately adjacent to the pipeline easement. These individuals may be directly impacted by construction, and Eco Logical Australia will continue to liaise with BWA regarding the possible avoidance of these individuals through design options. Where individual plants cannot be avoided, any impacts shall be considered in the context of a translocation, propagation and offsets strategy.

Three Pink-tailed Worm Lizards were recorded within one area of the easement, although other rocky outcrops were also mapped which contain potential habitat for the species. It is recommended that further surveys for the species be conducted immediately prior to construction works in potential habitat areas within the pipeline easement. Any lizards observed during these surveys should be relocated to nearby habitat of the same or higher habitat value away from the pipeline impact zone.

Approximately 49 hollow bearing trees occur within or near the pipeline easement. Eco Logical Australia will liaise with BWA to determine which hollow bearing trees can be conserved within the pipeline easement and which trees can be felled. A number of mitigation measures are recommended for trees to be felled in order to ensure that no fauna are injured during tree felling activities.

Numerous wombat burrows were observed within the pipeline easement, particularly adjacent to the Murrumbidgee River. Clearance of these burrows should be avoided where possible. If clearance is required, a non-invasive method should be used to deter wombats from returning to burrows before construction commences.

Swainsona sericea, which is listed as threatened under the NSW *Threatened Species Act 1995*, was identified throughout the pipeline easement where suitable habitat occurred. Areas where *Swainsona sericea* occurred in substantial numbers (>50) were recorded using GPS and mapped. No other threatened species were observed within the study area. Overall the level of impacts on threatened species is negligible.

It is understood that BWA will provide the results of this survey to relevant government agencies. Specific survey results should not be made public to provide protection to the threatened species onsite.

2 Introduction

2.1 BACKGROUND

ACTEW Corporation Pty Ltd is proposing to pump water from the Murrumbidgee River at Angle Crossing within the ACT and transfer it through an underground 12 km pipeline to Burra Creek in NSW. Burra Creek flows into the Googong Reservoir through the Commonwealth Government's Googong Foreshores. The underground pipeline would commence in the ACT heading in an easterly direction for 2.8 km and then cross the border into NSW where it will continue for a further 9.2 km.

This project is one of the preferred options for delivering improved security to the ACT's water supply. Recent drought conditions experienced in Canberra and the broader region, along with predicted climate change impacts and population growth has increased the demand for water supply and facilitated a search for a more reliable water supply.

2.1.1 Conditions of Consent/Approval

The development of the Murrumbidgee to Googong pipeline is subject to an environmental approvals process that was conducted under an agreement between the Commonwealth, NSW and ACT governments. The relevant agencies under each jurisdiction are:

- the ACT Planning and Land Authority (ACTPLA),
- the NSW Department of Planning (DoP), and
- the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPAC).

All three jurisdictions have granted approval for the proposed pipeline (relevant approval conditions detailed below). Under the environmental approval conditions outlined by the ACT, NSW and Commonwealth regulatory agencies, pre-clearance surveys within the pipeline easement need to be undertaken for threatened species, with all three regulatory agencies making particular mention of the Small Purple-pea *Swainsona recta*.

NSW Approval

NSW approval for the project was issued 30 March 2010. Approval conditions relating to pre-clearance surveys are:

> *2.6 In regards to the Endangered Purple-pea, Swainsona recta the proponent shall:*
>
> *a) avoid and protect the identified population of the species during construction of the crossing at the Goulburn to Cooma railway line;*
>
> *b) submit to the Director-General and DECCW, as part of the Construction Environmental Management Plan required under condition 6.2, a pre construction survey of all potentially suitable habitat along the pipeline easement. The survey shall be conducted during the species flowering period; and*
>
> *c) minimise impacts to any population identified during the surveying described in b), through detailed design and alignment refinements.*

2.7 The pipeline easement width shall be reduced to the minimum feasible width in areas along the easement that are known to contain endangered ecological communities and/or threatened species habitat. Details regarding the extent and location of these reductions shall be included in the Construction Environmental Management Plan contained in condition 6.2.

2.8 Any clearing of native vegetation, native grassland particularly Box-Gum Grassy Woodland and rocky outcrops during construction of the pipeline shall be limited to the minimum feasible extent.

ACT Approval

ACT approval for the Murrumbidgee to Googong pipeline was granted on 3 August 2010. Approval conditions relating to pre-clearance surveys are:

B20. During the month of October, and prior to any works commencing within the parts of the pipeline east of the Monaro Highway, the applicant must survey the area subject to works for the pipeline within Block 119 District of Tuggeranong to determine the exact location of any Swainsona recta plants.

C2. The applicant must take all reasonable steps and precautions to avoid disturbance of all Swainsona recta plants and habitat within the site.

C3. In the case it is not possible to avoid disturbing the Swainsona recta and nearby habitat the applicant shall, prior to disturbing them, develop an offset strategy to mitigate the impacts on this species. This strategy shall include research into the best methods for translocation, the translocation of the effected plants, and re-establishment of these plants within an appropriate location to the satisfaction of the Conservator.

Commonwealth Approval

Commonwealth approval was issued on 29 October 2010. Conditions relating to pre-clearance surveys are:

3. The person taking the action must submit a Biodiversity Management and Offset Plan to address impacts on listed threatened species and ecological communities for the Minister for approval prior to commencing construction. The Biodiversity Management and Offset Plan must include the following:

a) a description of the survey effort already undertaken for listed threatened species and ecological communities, and any extra surveys that may be required pre-construction as described in condition 3.b);

b) an outline of the methodology of additional flora surveys, by a botanist with expertise in surveying for the Small Purple-pea (Swainsona recta), Hoary Sunray (Leucochrysum albicans var. tricolour) and Button Wrinklewort (Rutidosis leptorrhynchoides). The surveys must be conducted at the correct time of year, and specifically target the parts of the project area that are most likely to provide habitat for the species, particularly in areas that were not surveyed for the species previously;

c) precise mapping showing the location of all known Small Purple-pea, Hoary Sunray and Button Wrinklewort plants in the protected area, the location of the areas of greatest potential for having additional plants of these species in the project area and the precise location of the pipeline easement. These maps must be provided to the Department but must not be published at a scale that indicates individual plants;

d) demonstrate how construction of the pipeline and associated activities will avoid removing any individuals of the Small Purple-pea, or, if removal is necessary, provide details of a Small Purple-pea land offset, management and planting programs to ensure no net loss to the population;

e) describe how the alignment of the pipeline easement minimises impacts on the Small Purple-pea, Hoary Sunray, Button Wrinklewort and Pink-tailed Worm Lizard (Aprasia parapulchella);

f) explain how the extent and condition of EPBC listed threatened ecological communities (TEC's) was determined;

g) detailed mapping of TEC's, including habitat condition, including the project area and other areas proposed to be used as offsets;

h) a description of how the Small Purple-pea, Hoary Sunray and Button Wrinklewort and Pink-tailed Worm Lizard will be managed during construction of the pipeline;

i) a description of how native vegetation (including TEC's) will be rehabilitated after the construction of the pipeline;

j) a description of how any threatened plants will be propagated and re-established;

k) a description of how weed management and rehabilitation of native vegetation and threatened species habitat will be undertaken and funded in the long-term; and

l) commitments to managing and protecting in perpetuity any parcel of land set aside as an offset.

Construction may not commence in any areas that contain habitat for the Small-Purple pea, Hoary Sunray, Button Wrinklewort and Pink-tailed Worm Lizard or in TEC's until the plan is approved. The approved plan must be implemented.

Other commitments

In addition to the above approval requirements for pre-clearance surveys for threatened species, a number of commitments have been made by BWA during the EIS and PER approvals process to conduct pre-clearance surveys for potential fauna habitats including hollow bearing trees and rocky outcrops. These surveys are required to be conducted within the pipeline easement prior to the start of construction.

2.2 STUDY AREA

The pipeline easement is located south and south-west of Canberra. The project area traverses 12 km, bound by the Murrumbidgee River intake location in the west (near Angle Crossing) and Burra Creek discharge site in the east (see **Figure 1**). The construction impact zone for the pipeline will generally include a 40 m corridor around the pipeline location (referred to as the pipeline easement). The actual construction impact will vary in width from 15 m to 40 m and will be determined by considering a number of drivers including occurrences of threatened species and ecological communities, construction management and safety considerations, and land form.

Land within the pipeline corridor is predominately privately held rural residential land. The majority of the pipeline easement traverses a highly modified agricultural landscape. Activities within the area include sheep and cattle grazing, small scale cropping, pasture improvement and equine farming. There are also a small number of allotments that are on Commonwealth land and Crown land.

The pipeline spans three separate jurisdictions as follows:

Australian Capital Territory (ACT)

- Intake/low lift pump station, high lift pump station and the first 2.8 km of the pipeline until the ACT/NSW border near the Monaro Highway, Williamsdale.

New South Wales (NSW)

- Remaining 9.2 km of the proposed pipeline from the ACT/NSW border near the Monaro Highway, Williamsdale to the discharge located adjacent to the Williamsdale Road – Burra Road intersection;
- Discharge location and mini-hydro infrastructure in the vicinity of the intersection of Williamsdale and Burra Roads.

Commonwealth of Australia

- Pipeline crossing in the designated land at the Monaro Highway corridor as defined under the National Capital Plan.

In addition to the defined pipeline easement, the study area also included areas within lots 1102 (201DP754889), 1104 (152DP754889) and 1106 (170DP754889) that may be impacted by a potential re-alignment of the pipeline corridor. This is known as the 'alternate option', and methods and results have been discussed separately for this option (Section 3.6 and 4.5 respectively).

Topography along the pipeline route changes considerably. Elevation in the surrounding area varies from 600 m at Angle Crossing to 1,120 m at Gibraltar Hill. The topography surrounding the western end of the pipeline corridor, around Angle Crossing, is characterised by deeply incised hills and gorges along the Murrumbidgee River Corridor. The land sharply rises towards the Monaro Highway to broad, elevated, flat to undulating plains before dropping away to the east of the Highway where the land is characterised by the broad low lying plains of the Jerrabomberra and Tuggeranong Valleys and smaller flood plains associated with Jerrabomberra Creek (ACTEW 2009).

The central part of the pipeline corridor then passes through the Gibraltar Range, which is an abruptly rising ridge line with the peak of Gibraltar Hill to the north of the proposed pipeline at an elevation of 1,120 m. The land surrounding the eastern extent of the pipeline corridor then falls back down to the broad low lying plains of the Jerrabomberra and Tuggeranong Valleys and smaller flood plains associated with Jerrabomberra Creek, Burra Creek and local drainage lines. These landforms continue to the Burra township and the conclusion of the pipeline corridor at Burra Creek (ACTEW 2009).

Remnant vegetation across the study area ranges from non-native pasture to native grasslands, grassy woodlands on the undulating lowland hills and dry grassy/shrubby sclerophyll forest on elevated rocky parts of Gibraltar Hill and Mount Burra and on the 'saddle' that links the two. Main fauna habitats include grassland, woodland, open forest, rock outcrops, tree hollows and wet areas that range from major river systems to farm dams (ACTEW 2009).

2.3 AIM OF STUDY

This study was undertaken within the pipeline easement, including an alternate route option in Lots 1102, 1104 and 1106, prior to commencement of construction, to:

- Survey for and map the location of threatened plant species including the Small Purple-pea, Silky Swainsona-pea, Hoary Sunray, and Button Wrinklewort;
- Survey for and map the location of Pink-tailed Worm Lizards and their habitat;
- Map and mark hollow-bearing trees for conservation and/or re-instatement post construction;
- Map and mark the location of wombat burrows.

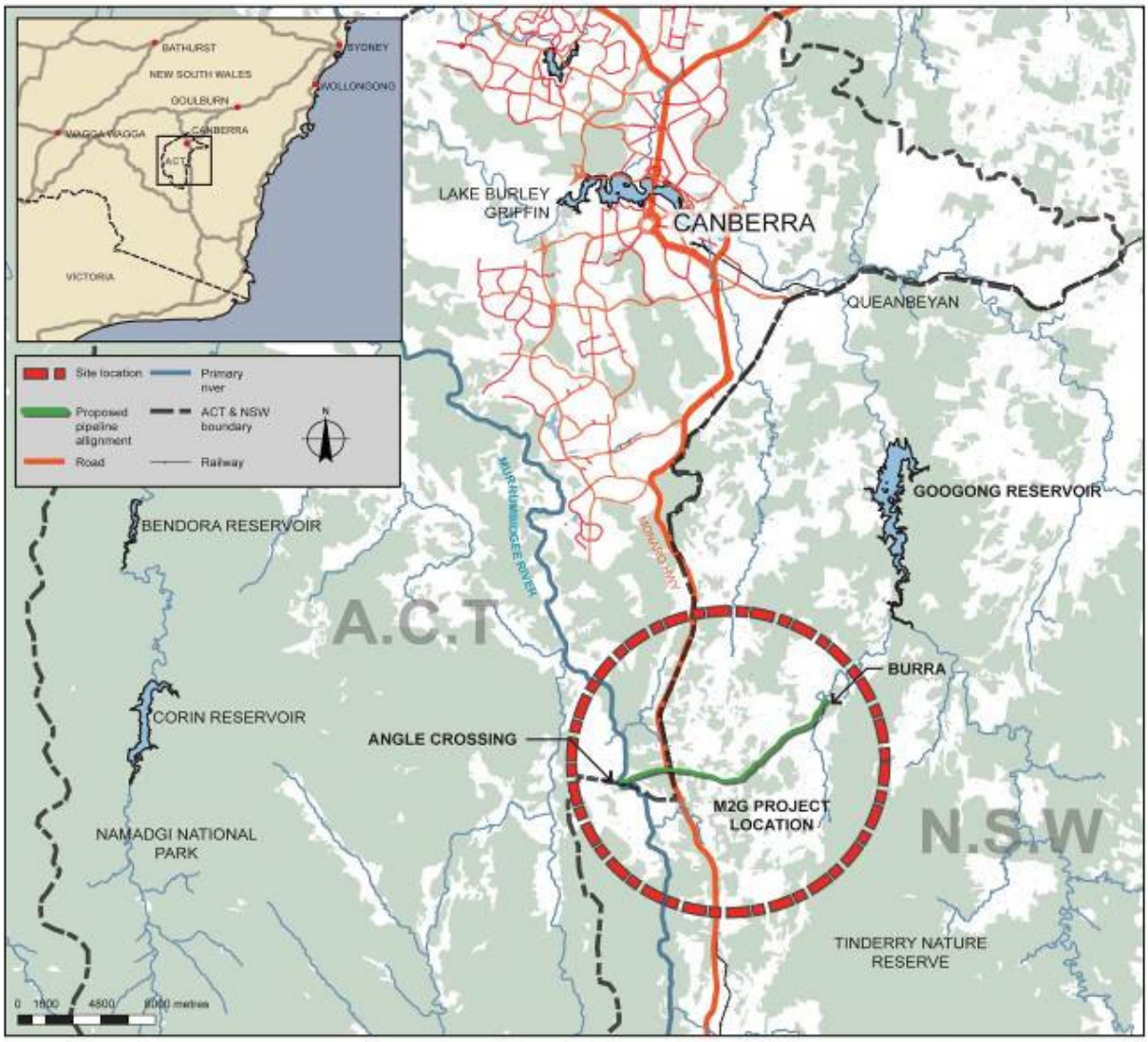


Figure 1: Regional overview of study location (source: ACTEW 2010)

3 Methodology

Prior to surveys being undertaken, Eco Logical Australia conducted a desktop review using previous mapping data (prepared by Biosis, in ACTEW 2009) and a site verification to determine the extent and scope of the area that required surveys. A detailed plan for conducting pre-clearance surveys was then developed in consultation with BWA. Key components of the survey methodology were the timing of surveys to coincide with optimum seasonal conditions but also within a reasonable time frame of construction starting.

Eco Logical Australia undertook ecological surveys during September and October 2010 along the pipeline easement. The survey methodology was designed to identify species and habitats of conservation value that may be directly impacted by construction of the proposed pipeline.

The methodology was based around accepted general survey principles (vegetation surveys and rock-rolling) and aimed to specifically determine the presence of a number of threatened species and habitat features of conservation value, including:

- Small Purple Pea (*Swainsona recta*);
- Hoary Sunray (*Leucochrysum albicans var. Tricolor*);
- Button Wrinklewort (*Rutidosis leptorrhynchoides*);
- Silky Swainson-pea (*Swainsona sericea*);
- Pink-tailed Worm Lizard (*Aprasia parapulchella*);
- Hollow bearing trees; and
- Wombat burrows.

These pre-clearance surveys, in particular those for *Swainsona recta*, were designed to meet the requirements of the NSW, ACT and Commonwealth government approval conditions.

Pre-clearance surveys for species and habitats were conducted over 8 days from 28 September to 26 October 2010. Climate conditions (taken from BOM: Tidbinbilla, ACT) during these times ranged from 10°C to 24°C maximum. There was 174 mm of rainfall during the survey period. Approximately 19 mm of rain had fallen in the 2 weeks prior to surveys commencing. The timing and climatic conditions were considered ideal for flora and fauna surveys.

The entire 12 km, 40 m wide pipeline easement and the alternative alignment (refer to section 3.6) were surveyed by walking traverses. Specific areas were targeted for specific flora and fauna surveys based on the presence of suitable habitat, and are discussed below.

3.1 SWAINSONA RECTA

Swainsona recta is listed as an Endangered species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), NSW *Threatened Species Conservation Act 1995* (TSC Act) and ACT *Nature Conservation Act 1980* (NC Act).

Swainsona recta surveys were designed to most effectively meet the requirements of the conditions of approval (NSW, ACT and Commonwealth) as they relate to *Swainsona recta*. Prior to surveys commencing, endorsement of the survey methodology was sought and gained from DECCW (NSW), TAMS (ACT) and DEWHA (Commonwealth) to ensure surveys meet all regulator expectations.

Surveys for *Swainsona recta* involved 4 steps:

a. Determine potential habitat

Prior to conducting pre-clearance surveys, potential habitat within the pipeline easement was identified by desktop review, using previous mapping data (Biosis 2009), and a site verification visit to determine the extent and scope of the area that will require *Swainsona recta* surveys.

Previous vegetation mapping conducted during the project's EIS (ACTEW 2009) was used to guide the determination of potential habitat. Habitat for *Swainsona recta* is considered to be the grassy understorey of woodlands and open-forests. It is known to grow in association with understorey dominants that include Kangaroo Grass (*Themeda australis*), poa tussocks (*Poa spp.*) and spear-grasses (*Austrostipa spp.*).

Vegetation communities that would provide suitable habitat are:

- Apple Box Woodland
- Apple Box/Broad-leaved Peppermint Open Forest/Woodland
- Box Gum Grassy Woodland EEC
- Broad-leaved Peppermint Open Forest/Woodland
- Broad-leaved Peppermint/Brittle Gum Open Forest
- Natural Temperate Grassland or Secondary Grassland
- Peppermint/Brittle Gum/Bundy/Yellow Box Shrubby Woodland
- Peppermint/Snow Gum Grassy Woodland
- Secondary Grassland – Box Gum Grassy Woodland
- Snow Gum Grassy Woodland.

Potential habitat for *Swainsona recta* includes the list of vegetation communities identified above that contain a dominant native understorey. The determination of a native understorey was conducted whilst on location during an initial reconnaissance and surveys. The vegetation communities were mapped during the EIS and were used in these pre-clearance studies to determine the location of likely habitat.

b. Establish local flowering periods

Before *Swainsona recta* pre-clearance surveys were conducted within the pipeline easement, Eco Logical Australia established the local flowering conditions and occurrences to ensure surveys were conducted at the most appropriate time. *Swainsona recta* are known to flower from September to December with the optimal flowering period considered to be October (dependent on climatic conditions such as recent rain events and warmer temperatures).

The locations of previously recorded *Swainsona recta* individuals / populations were identified in the EIS. Prior to pre-clearance surveys, weekly spot checks of these known individual and population locations were conducted from early September to determine the onset of the local flowering period. Once the local flowering period was determined, targeted pre-clearance surveys were then conducted within the pipeline easement.

c. Surveying techniques

Given that the flowering times of individual plants are likely to be staggered across the species' flowering period, Eco Logical Australia conducted two pre-clearance surveys of potential *Swainsona recta* habitat within the pipeline easement. The first survey was conducted after determining the onset of the local flowering period and the second survey was conducted two weeks after the first survey. Two pre-clearance surveys, separated by a 2 week period, were used to improve the likelihood that all individuals and populations were identified prior to construction.

The pre-clearance surveys were undertaken as a walked traverse through potential habitat within the pipeline easement and surrounding habitat by 2 ecologists with experience in identifying *Swainsona spp*. in the field. The construction impact zone known as the pipeline easement will include a 40 m corridor around the pipeline location. It is important to note that while the construction impact zone may be reduced to 15 m in parts to avoid highly sensitive areas, the pre-clearance surveys were conducted for the 40 m corridor width at all times.

The walked traverse was conducted to ensure all potential habitat within the varying pipeline easement was surveyed. An ecologist can effectively survey a corridor width of 10m (assuming 5m on either side of the ecologist during the traverse). For the areas of the easement where the width is up to 40m, the traverse doubled back along the easement until the entire width was adequately surveyed.

d. Identifying Swainsona recta individuals

Swainsona recta was identified in the field via a morphological inspection of any *Swainsona spp.* individuals. Both *Swainsona recta* and *Swainsona sericea* are known to occur within the study area and its surrounds. *Swainsona recta* differs from *Swainsona sericea* by its generally greener appearance of the foliage, more erect habit, narrow and wider spacing leaflets and the relative absence of hairs on leaves.

Upon identifying *Swainsona* specimens, the species and a GPS location was recorded for each individual or population (if multiple individuals). Plants were photographed and the location of specimens was also suitably identified (pegged, photographed and numbered) on site.

When *Swainsona recta* individuals were identified on site, additional survey effort was undertaken on the adjoining area until a 40 m wide easement not containing *Swainsona recta* was identified and subsequently mapped. This information has been provided to BWA to guide avoidance and mitigation measures including potential micro alignment refinements of the pipeline location.

3.2 OTHER THREATENED FLORA SPECIES

During traverses for *Swainsona recta*, searches were also conducted for other threatened plant species with potential to occur within the area. Any individuals (or areas containing a substantial abundance in the case of *Swainsona sericea*) were recorded using a GPS. Threatened species with the potential to occur within the easement include:

- Swainsona Silky Pea *(Swainsona sericea)* – listed as Vulnerable under the TSC Act.
- Hoary Sunray *(Leucochrysum albicans var. tricolor)* – listed as Endangered under the EPBC Act.
- Button Wrinklewort *(Rutidosis leptorrhynchoides)* – listed as Endangered under the EPBC Act, TSC Act and NC Act.

These three species have very similar habitat requirements to *Swainsona recta* and are likely to occur in similar habitat types.

3.3 PINK-TAILED WORM LIZARD

Pink-tailed Worm Lizard (PTWL) is listed as Vulnerable under the EPBC Act, TSC Act and NC Act. The PTWL occurs in open grassland habitats which have a substantial cover of small rocks. The lizards are most commonly found sheltering under small rocks (15 - 60 cm basal dimensions) shallowly embedded in the soil (2 - 5 cm). Surveys should ideally occur in temperatures around 22^{o}C, and temperatures in excess of 28^{o}C should be avoided. Surveys should not be conducted on rainy days, but should ideally occur 2 weeks after rain.

Rocky habitats within the pipeline easement indicate potential PTWL habitat. Areas containing rocky habitats were identified using the EIS data (ACTEW 2009) and verified during field surveys. The EIS recorded

extensive areas of rocky outcrop in the Murrumbidgee River corridor, along Burra Creek and to a lesser extent on the Gibraltar 'saddle'. Smaller outcrops were associated with low hills and knolls, mainly in the western sections of the study area.

During traverses of the pipeline easement, rocky habitats were identified and recorded using GPS with data provided to BWA for mapping purposes.

Opportunistic and targeted searches for the PTWL were undertaken within rocky habitats. A selection of potential habitat rocks were rolled and checked for the presence of PTWL. All rolled rocks were immediately returned to the position in which they were found. Surveys were conducted in October, as PTWL activity is highest during spring and early summer.

The location of any identified PTWL was recorded using GPS and data provided to BWA for mapping purposes. Photographs were taken of all individuals found.

3.4 HOLLOW BEARING TREES

Tree hollows can provide habitat for a range of arboreal fauna species including diurnal birds, possums, owls and microbats. For these species, tree hollows provide breeding sites and shelter from weather and predators. The removal of hollow-bearing trees can lead to the death or displacement of fauna reliant on the hollow.

During traverses of the entire pipeline easement, all trees containing hollows were clearly marked using spray paint and/or high visual flagging tape The location of these trees were also recorded using GPS and data was provided to BWA for mapping purposes.

3.5 WOMBAT BURROWS

Common wombats (*Vombatus ursinus*) are known to occur within the immediate area. An individual wombat may have up to 12 burrows with a number of entrances leading to the one burrow. When one burrow is inactive, another burrow is made and becomes active.

During traverses of the entire pipeline easement, wombat burrows were identified and checked for activity. Burrows were clearly marked (pegged and flagged), and were recorded using GPS with data provided to BWA for mapping purposes.

3.6 ALTERNATE OPTION

An alternate pipeline route is being considered within Lots 1102, 1104 and 1106. For this alternative route surveys were conducted for all the above species/habitat values through an area of approximately 1500 m in length and 60 m in width.

4 Results

The results of the pre-clearance surveys are summarised below. Locations of species and habitats recorded during surveys are presented in the maps at Appendix A. The raw data results of all surveys are provided in Appendix B.

4.1 SWAINSONA RECTA

4.1.1 Spot Checks

Spot checks were carried out on known *Swainsona recta* populations in two locations to determine the local flowering period for the species. These locations were:

- the railway corridor on land between the rail tracks and the Monaro Highway; and
- the proposed Williamsdale offset site.

Table 1 below outlines the observations of *Swainsona* species made during the spot checks.

Table 1: *Swainsona recta* spot checks to determine local flowering period

Date	Where	Comment
10/9/10	Rail corridor	Considerable rain in the previous week/s, however no *Swainsona* observed.
10/9/10	Offset site	No *Swainsona* observed.
17/9/10	Rail corridor and offset	No *Swainsona* observed.
22/9/10	Rail corridor and offset	No *Swainsona* observed.
29/9/10	Rail corridor and offset	*Swainsona* easy to spot, and a few plants beginning to flower. Estimate <5% within the Williamsdale property. Within the rail corridor they are also beginning to flower. Tom O'Sullivan separately confirmed the beginning of the flowering period within the rail corridor (fenced off area).
05/10/10	Rail corridor	*Swainsona* in flower and easily located.

4.1.2 Field Surveys

Following the confirmation of flowering in early October, the pre-clearance *Swainsona recta* surveys were conducted on 11-13 October and 25-26 October 2010.

The flowering season for *Swainsona spp*. and other herbaceous forbs was considered to have started later than in previous years. The region had experienced significant rainfall during September, which carried through to early October. This had pushed the general flowering periods for many species (besides exotic annuals) to later than previous seasons.

Two *Swainsona recta* individuals were recorded within the pipeline easement with another individual recorded approximately 5 metres from the corridor. All individuals recorded were observed within or very

close to the railway corridor (**Appendix A**). Also within the broad railway corridor area surrounding, but outside the pipeline easement, a number of *Swainsona recta* individuals were observed (**Appendix A**).

4.1 OTHER THREATENED FLORA SPECIES

Swainsona sericea were recorded in a number of areas along the pipeline easement where suitable habitat occurred. The abundance of *Swainsona sericea* varied considerably from a few individuals to areas containing a high density. Areas of high density generally represented sites containing 50-100 individuals and were recorded using GPS. No other threatened flora species were recorded within the pipeline easement.

4.2 PINK-TAILED WORM LIZARD

PTWL is typically found in open grassland habitats that have a substantial cover of small rocks. A total of 2.31 ha of known or potential habitat for the PTWL will be directly impacted by the proposed pipeline (ACTEW 2009).

The moderate temperatures following periods of substantial rains prior to the surveys made prime conditions for PTWL searches. PTWL individuals were recorded in one area within the pipeline easement (**Appendix A**). Within the surrounding rocky area, approximately 100 rocks were rolled revealing three individuals (two individuals were observed beneath a single rock). The habitat would be considered to be of moderate quality with grazing occurring sporadically and a number of exotic grass species present. No other PTWL were recorded within the study area, however rocky outcrops (areas of potential habitat) were also recorded and mapped (**Appendix A**).

It is recommended that further surveys for PTWL be conducted immediately prior to construction works in potential habitat areas. Any PTWL or other fauna observed during these surveys should be relocated to nearby habitat of the same or higher habitat value away from the pipeline impact zone.

It may be possible to relocate suitable sized habitat rocks to nearby habitat. If so, an ecologist should be present to supervise the relocation.

4.3 HOLLOW BEARING TREES

Approximately 32 hollow bearing trees were recorded during the field surveys within or immediately adjacent to the pipeline corridor with another 17 trees identified in the surrounding area (**Appendix A**). These trees consisted of primarily eucalypt species including Blakely's Red Gum (*Eucalyptus blakelyi)*, Apple Box (*E. bridgesiana*), Yellow Box (*E. melliodora*) and Brittle Gum (*E. mannifera*).

4.4 WOMBAT BURROWS

Numerous wombat burrows were recorded within the western section of the pipeline easement particularly adjacent to the Murrumbidgee River (**Appendix A**). To the east of the river the number of burrows tended to decline, with occasional burrows recorded throughout the rest of the pipeline easement. The majority of burrows showed signs of activity.

4.5 ALTERNATE OPTION

The vegetation within the alternative pipeline option in Lots 1102, 1104 and 1106 is considered to vary from good to moderate condition. Approximately one-third to a one-half of the proposed alternative route traverses land considered to be Box-Gum Woodland under both the Commonwealth and NSW definitions. The Box-Gum Woodland varies from areas of open woodland to derived grassland. Particular patches of derived

native grassland contain a significant abundance of *Swainsona sericea* individuals numbering in one instance up to an estimated 1000 individuals.

The vegetation within the alternative route through lots 1104 and 1106 is considered to be of moderate to high condition. There was a low to moderate grazing pressure observed throughout the alternative route.

5 Recommendations

5.1 SWAINSONA RECTA

For individuals that may be directly impacted by construction, Eco Logical Australia will continue to liaise with BWA regarding the possible avoidance of these individuals through detailed design, alignment and construction technique refinements in order to minimise impacts of the project on this species.

Where individual plants cannot be avoided, any impacts shall be considered in the context of a proposed translocation, propagation and offsets strategy described below.

5.1.1 Translocation and propagation plan (potential offsets)

If *Swainsona recta* individuals cannot be avoided, the feasibility of undertaking translocation (including soil relocation) and propagation of individuals will be investigated. This will serve as a mitigation / offset measure if individual plants are to be directly impacted to avoid a net loss of *Swainsona recta* within the area. The plan would be developed in conjunction with stakeholders, including:

- Local botanists familiar with the species;
- DECCW, TAMS and SEWPAC;
- Victorian Department of the Sustainability and the Environment (DSE) who have experience in *Swainsona recta* propagation and replanting;
- Botanists at the Australian National Botanic Gardens; and
- BWA construction personnel.

The plan would be developed to ensure that all regulators support the activities proposed and would be developed in the context of NSW, ACT and Commonwealth priority actions as part of the ongoing recovery strategy for the species.

5.2 HOLLOW-BEARING TREES

Eco Logical Australia will liaise with BWA to determine which hollow bearing trees can be conserved within the pipeline easement and which trees can be felled. If possible, felled trees may be kept for reinstatement during the rehabilitation of the development footprint.

It is recommended that marked trees be left standing for a minimum of 1 night after surrounding non-marked trees have been cleared with the presumption that any fauna present will move out of the area on their own accord. A ‘stag watch’ of hollow-bearing trees at dusk should be conducted to:

- Determine if any fauna are still present.
- If no fauna are confirmed, then marked trees can then be cleared.

A qualified ecologist will be onsite prior to the commencement of works the next day to conduct a detailed inspection and fauna relocation if necessary.

5.3 WOMBAT BURROWS

The loss of wombat burrows should be avoided were possible. Should this not be possible, a non-invasive method should be used to deter wombats from returning to burrows within the pipeline easement before construction commences within that area.

References

ACTEW 2010, Murrumbidgee to Googong Water Transfer, Public Environment Report June 2010. Full PER and supplementary documents are available at: <http://www.actew.com.au/WaterSecurity/MajorProjects/murrumbidgee_googong.aspx>

ACTEW 2009, *Murrumbidgee to Googong Water Transfer, Environmental Impact Statement December 2009*. Full EIS and supplementary documents are available at: http://www.actew.com.au/watersecurity/majorProjects/Murrumbidgee_to_Googong/EIS_EA_final/

Biosis 2009, *Murrumbidgee River to Googong Dam Water Transfer Pipeline: Terrestrial Flora & Fauna Impact Assessment*. Appendix H in: ACTEW 2009, *Murrumbidgee to Googong Water Transfer, Environmental Impact Statement*.

Department of Sustainability, Environment, Water, Population and Communities (2010). *Leucochrysum albicans var. Tricolor;* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of Sustainability, Environment, Water, Population and Communities (2010). *Aprasia parapulchella;* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/sprat.

Department of Sustainability, Environment, Water, Population and Communities (2010). *Swainsona recta* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/sprat.

New South Wales, Department of Environment and Climate Change (2009) *Button Wrinklewort* in Threatened Species Profile; threatened species, populations and ecological communities of NSW. Available from http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10739.

New South Wales, Department of Environment and Climate Change (2010) *Swainsona sericea* in Threatened Species Profile; threatened species, populations and ecological communities of NSW. Available from http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=107383.

Appendix A - Maps

Maps 1-20 provided below detail the pre-clearance survey results of the pipeline corridor and adjacent areas.

Appendix B - Results

Provided below are the raw field survey results. Refer to the Results sections for records within the pipeline easement and immediate surrounds. Projections are in mapping Datum GPA1994 MGA Zone 55.

Hollow Bearing Trees (HBT)

Type	Y-Projection	X-Projection	Species	Size
HBT	6060522	694016	E.dives	small
HBT	6060520	694042	E.mannifera	moderate
HBT	6060537	694116	E.mannifera	moderate
HBT	6060527	694146	E.mannifera	moderate
HBT	6060528	694145	E.mannifera	moderate
HBT	6060544	694124	Eucalyptus sp	moderate
HBT	6060543	694168	E.mannifera	large
HBT	6060493	694419	E.mellidora	not noted
HBT	6060493	694505	E.blakeyli	moderate & small
HBT	6060461	694915	E.mellidora	moderate
HBT	6060443	694937	E.mellidora	small
HBT	6060381	695293	E.mellidora	moderate & small
HBT	6060379	695300	E.mellidora	small
HBT	6060416	694584	E.mellidora	small
HBT	6060457	694438	E.mellidora	small
HBT	6060463	694408	E.dives	small
HBT	6060497	694239	E.mannifera	small
HBT	6060539	694063	E.mannifera	large
HBT	6060538	693726	E.blakeyli	small
HBT	6060663	692999	Stag	moderate
HBT	6060669	692736	Eucalyptus sp	small
HBT	6060648	693011	E.dives	small
HBT	6060554	693322	Eucalyptus sp	small
HBT	6060560	694386	E.mannifera	moderate & large
HBT	6060612	694499	E.bridgesiana	small
HBT	6060559	695316	Stag	large
HBT	6060621	695133	E.mellidora	moderate & large
HBT	6060239	697249	Eucalyptus sp	moderate
HBT	6060234	697222	Eucalyptus sp	moderate
HBT	6060228	697276	Eucalyptus sp	small
HBT	6060350	697564	Eucalyptus sp	moderate
HBT	6060356	697580	Eucalyptus sp	large
HBT	6060658	697855	E.bridgesiana	moderate
HBT	6060682	697852	E.bridgesiana	small
HBT	6060219	696336	Eucalyptus sp	not noted

HBT	6060167	696381	E.mellidora	moderate & large
HBT	6061036	698227	Eucalyptus sp	not noted
HBT	6061103	698367	Eucalyptus sp	not noted
HBT	6061128	698324	E.mannifera	not noted
HBT	6060365	691577	Stag	large
HBT	6060543	692011	E.mellidora	moderate
HBT	6060592	692240	E.mellidora	moderate
HBT	6060670	6092799	E.mellidora	moderate
HBT	6060660	692980	Stag	moderate
HBT	6060527	693367	E.mellidora	small
HBT	6060552	692165	E.mellidora	moderate
HBT	6060429	691829	E.blakeyli	not noted
HBT	6060527	694044	E.mannifera	moderate
HBT	6060474	694125	E.mannifera	moderate
HBT	6060475	694080	E.mannifera	moderate
HBT	6060496	694070	E.mannifera	moderate

Wombat Burrows (WB)

Type	Y-Projection	X-Projection	Comments (active status)
WB	6060508	693761	Potentially active
WB	6060181	691105	Active (sth side of road)
WB	6060155	691095	Active
WB	6060149	691106	2 holes – 1 active
WB	6060041	691077	Active
WB	6060036	691078	6 entrances within 5 m
WB	6060012	691075	Inactive
WB	6065999	691071	Active
WB	6060223	691131	Active (nth side of road)
WB	6060217	691135	Active
WB	6060211	691147	Active
WB	6060224	691157	Active
WB	6060258	691180	Inactive – flooded on steep bank
WB	6060255	691190	Active -on steep bank
WB	6060252	691191	2 holes on steep bank - active
WB	6060251	691193	Potentially active
WB	6060259	691220	Active - down steep bank on flat
WB	6060266	691231	2 holes potentially active & active
WB	6060266	691239	Active
WB	6060282	691266	Active
WB	6060155	691339	Potentially active
WB	6060163	691325	Not active
WB	6060291	691404	4 entrances - one active
WB	6060379	691646	2 holes - active
WB	6060543	692106	Potentially active & inactive
WB	6060607	692301	Flooded - inactive
WB	6060651	692452	Flooded - inactive
WB	6060703	692538	Potentially active
WB	6060278	691513	Under stag - potentially active

Pink-tailed Worm Lizard (PTWL)

Type	Y-Projection	X-Projection	Habitat quality	PTWL recorded
PTWL	6060400	694921	Moderate	no
PTWL	6060172	696369	Low	no
PTWL	6060672	692524	High	yes
PTWL	6060655	692554	High	yes
PTWL	6060581	692321	Low	no
PTWL	6060639	692958	Low	no
PTWL	6060665	692809	Low	no
PTWL	6060345	691555	Low	no
PTWL	6060577	692150	Moderate	no
PTWL	6060629	692354	Low	no
PTWL	6060676	692526	Moderate	no

Swainsona recta (S.recta)

Type	Y-Projection	X-Projection	Individuals Recorded
S.recta	6060521	693793	1 plant
S.recta	6060461	693772	1 plant
S.recta	6060524	693733	1 plant
S.recta	6060605	693748	1 plant
S.recta	6060610	693758	3 plants
S.recta	6060611	693766	1 plant
S.recta	6060022	693636	1 plant
S.recta	6060025	693639	1 plant
S.recta	6060272	693831	1 plant
S.recta	6060245	693829	1 plant
S.recta	6060546	693782	1 plant
S.recta	6060578	693778	1 plant
S.recta	6060583	693771	1 plant
S.recta	6060532	693699	1 plant
S.recta	6060740	693706	4 plants
S.recta	6060787	693681	4 plants
S.recta	6060793	693682	6 plants
S.recta	6060872	693693	7-8 plants
S.recta	6060879	693708	2 plants

Swainsona sericea (S.sericea)

Type	Y-Projection	X-Projection	Estimated Abundance
S.sericea	6060401.926	695298.1824	50+ plants
S.sericea	6060708.785	694728.9115	1000+ plants
S.sericea	6060778.249	694924.3157	200+ plants
S.sericea	6060486.404	694293.4713	50+ plants
S.sericea	6060469.871	695545.3061	50+ plants

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Appendix F **Vegetation Condition Assessment**

Summary of Existing Vegetation Condition – Murrumbidgee to Googong Water Transfer Project

Prepared for
Bulk Water Alliance Joint Venture

March 2011

DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Summary of Existing Vegetation Condition – Murrumbidgee to Googong Water Transfer Project
Project Number	11CANECO-0002
Prepared by	Tom O'Sullivan
Approved by	Rohan Watson
Status	Draft
Version Number	V2
Last saved on	10 March 2011

ACKNOWLEDGEMENTS

This document has been prepared by Tom O'Sullivan (Blue Gum Ecological Consulting) on behalf of Eco Logical Australia Pty Ltd.

Contents

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1 Introduction

This report provides a summary of the *existing* vegetation conditions within the proposed construction corridor (as at 21 February 2011) for the Murrumbidgee River to Googong Dam Water Transfer Pipeline (M2G).

The report has been prepared in response to the NSW Department of Planning's letter (dated 10 December 2010) requesting a summary of the *existing* vegetation conditions for inclusion in a revised Construction Environmental Management Plan (CEMP).

Principal documents used in the preparation of this report are:

- M2G Rapid Vegetation Assessment of the 'Hard Rock' Realignment route (Eco Logical Australia, February 2011);
- Murrumbidgee River to Googong Water Transfer - Construction Environmental Management Plan, BWA-M2G-EN-PLN-001-2 (Bulk Water Alliance, 6 December 2010);
- Murrumbidgee to Googong Water Transfer – Terrestrial Ecology Management Plan, BWA-M2G-EN-ECP-007-1 (Bulk Water Alliance, October 2010);
- Murrumbidgee to Googong Water Transfer – Landscape Rehabilitation Management Plan, BWA-M2G-EN-ECP-008-1 (Bulk Water Alliance October 2010);
- Murrumbidgee River to Googong Dam Water Transfer Pipeline: Terrestrial Flora & Fauna Impact Assessment (Biosis Research June 2009);
- Woodlands for Wildlife: *ACT Lowland Woodland Conservation Strategy. Action Plan 27* (ACT Government 2004); and
- A Vision Splendid of the Grassy Plains Extended: *ACT Lowland Native Grassland Conservation Strategy. Action Plan 28*. (ACT Government 2005).

2 Background

Vegetation surveys were conducted for the Environmental Assessment (EA) at various times between December 2006 and January 2009 (Biosis Research, June 2009). Methods used to determine vegetation type, extent and condition included random meanders, linear transects and plot-based vegetation sampling.

Floristic information gathered during the EA process was used to rank the vegetation according to the degree to which it resembled relatively natural undisturbed vegetation by assessing the following parameters.

- Species composition and cover abundance (i.e. species diversity and richness, degree of weed invasion) determined by either plot-based sampling, transects or random meanders;
- Vegetation structure (representation of each of the original layers of vegetation); and,
- Resilience - the capacity of a site for natural regeneration. The key determinant here is soil disturbance (i.e. tilled/cropped soil = low resilience).

Original estimates of vegetation loss (by type and condition) were presented in Section 5.2 of the EA report (Biosis Research, June 2009). A subsequent recalibration of vegetation loss was presented in Table 4.5 of the Terrestrial Ecological Management Plan (Bulk Water Alliance, October 2010) and Table 1, Appendix A of the CEMP (Bulk Water Alliance, December 2010). Although there were some minor differences in these estimates - attributed to changes in the pipeline alignment and corridor width - the proportional impact on each vegetation type was essentially the same.

3 Subject Area

The subject area includes both the ACT and NSW components of the proposed M2G construction corridor, which extends from the Murrumbidgee River at Angle Crossing to the discharge point at Burra Creek, south of the Williamsdale Road and Burra Road intersection.

Block (or paddock) numbers referred to in this report correspond to those used in the Murrumbidgee to Googong Water Transfer Project A1 Locality map (Job # 0821, dated 05/03/2010) provided by BWA.

4 Tasks

The following tasks were undertaken in the preparation of this summary report:

- A brief reading of the documents referred to in Section 1, above.
- A brief visual re-evaluation of the vegetation within the subject area on 21 February 2011. The only exception was the Cooma-Goulburn Railway corridor and the western section of Block 1103, both of which contained high conservation value BGGW derived secondary grassland and known or potential habitat for *Swainsona recta*.
- Walked transects were conducted within Blocks 1102, 1104, 1106, 1108, 1109, 1203, 1205 and 1217. Other Blocks were viewed from roadsides and vantage points.
- A review of the documents for the ACT component of the pipeline.

5 Methods

Criteria used to determine vegetation condition

Vegetation condition was categorised as disturbed, good, moderate or poor. The latter category (poor) has been divided into four sub-categories to provide a finer analysis of this level and is based on the degree and extent of groundcover modification (i.e. proportion of native and non-native grasses), presence of isolated or scattered trees and soil disturbance. Descriptions of each category are as follows:

Good: Contains a high diversity of native herbaceous and/or woody sub-canopy species. Weeds are either absent or occur in very low densities. Structural layers are broadly consistent with the community type, or if modified, the natural soil profile remains intact.

Moderate: Contains a moderate diversity of native herbaceous and/or woody sub-canopy species. There is an increase in the abundance and distribution of non-native grasses and forbs, which may be abundant in localised patches. Structural layers are broadly consistent with the community type, or if

modified, the natural soil profile remains intact, though it may show signs of minor disturbance i.e. stock trampling.

Poor: Native herbaceous and/or woody species are either absent, occur in scattered patches or, if widespread, occur in low density. May be represented by mixed native pasture, non-native pasture, plantation or entirely weed dominated. Soil structure may range from partially intact to highly modified due to tilling, cropping or repeated application of fertiliser. This group is divided into the following sub-categories.

- *Sub-category 1: Highly modified community. Soil profile altered, tilled and cultivated for exclusively non-native pasture crop i.e. Phalaris, Oats. May also be severely affected by weed invasion or stock.*
- *Sub-category 2: Contains a mixed pasture comprising predominately non-native grasses with scattered (grazing tolerant) native grasses i.e. Austrostipa* spp*. and Austrodanthonia* spp.*). Weeds may be common. Soil possibly tilled or fertilised.*
- *Sub-category 3: May contain isolated or scattered paddock trees of native origin. The understorey is highly modified and contains disturbance tolerant native grasses such as Austrostipa* spp*. and Austrodanthonia* spp*. but generally the groundcover is dominated by non-native pasture grasses and/or weeds. Soil possibly tilled or fertilised.*
- *Sub-category 4: Vegetation dominated by woody weeds or monospecific stands of pioneer woody shrubs such as Burgan (Kunzea ericoides), which have established in response to previous fire or soil disturbances.*

Disturbed: Highly modified. Original vegetation has been removed and may be reduced to bare ground. Soil profile is highly modified.

6 Results

Overview - ACT Component of the Pipeline Corridor

Existing vegetation conditions have been transcribed to a series of aerial photographs and are presented in **Figures 1-3**. The linear extent of each condition category has been calculated and is presented in Table 1.

Approximately 1.384 km (45%) of the linear extent of the pipeline corridor within the ACT contained vegetation that was in good condition, 0.287 km (9%) in moderate condition, 1.330km (44%) in poor condition and 50 m (2%) disturbed.

The linear extents of the three poor sub-category components occurring in the ACT section are as follows:

- Sub-category 2: 0.329 km (11%)
- Sub-category 3: 0.821 km (27%)
- Sub-category 4: 0.180 km (6%)

Box Gum Grassy Woodland and Natural Temperate Grassland

Box Gum Grassy Woodland (BGGW) in moderate to good condition accounted for about 32% of the lineal extent of the pipeline corridor within the ACT. Approximately 44 % of the total vegetation within ACT was in poor condition and corresponded to sub-category's 2, 3 and 4.

Natural Temperate Grassland (NTG) in moderate to good condition accounted for about 23.7% of the lineal extent of the pipeline corridor within the ACT.

Overview - NSW Component of the Pipeline Corridor

Existing vegetation conditions within the NSW component of the pipeline corridor have been transcribed to a series of aerial photographs and are presented in **Figures 4-6**. The linear extent of each condition category across each block has been calculated and is presented in **Table 1**.

Approximately 2.775 km (30%) of the linear extent of the pipeline corridor within NSW contained vegetation that is in good condition, 0.625 km (7%) that is in moderate condition and 5.726 km (63%) that is in poor condition.

The linear extents of each sub-component of the poor condition category occurring in the NSW section are as follows:

- Sub-category 1: 4.506 km (49%)
- Sub-category 2: 0.72km (8%)
- Sub-category 3: 0.5km (9%)

Box Gum Grassy Woodland

BGGW in moderate to good condition accounted for 34% of the total linear extent of the pipeline within NSW. Approximately 13.4 % of the total vegetation within NSW was in poor condition and corresponded to sub-category's 2 and 3.

Table 1: Existing vegetation conditions within each Block within the subject area.

	Condition (distances in metres)			
Block (Property) No.	**Disturbed**	**Poor**	**Moderate**	**Good**
1102 (NSW)		(1) 60m	185m	790m
1107 (NSW)		(3) 500m (1) 415m	440m	465m
1203 (NSW)		(2) 245m		
1205(NSW)		(2) 125m (1) 70m		105m
Road Easement (NSW)		(1) 1920m		945m
1217 (NSW)				470m
1223 (NSW)		(2) 350m		
1225 (NSW)		(1) 100m		
1302 (NSW)		(1) 415m		
1303 (NSW)		(1) 60m		
1305 (NSW)		(1) 165m		
1309 (NSW)		(1) 195m		
1310 (NSW)		(1) 310m		
1312 (NSW)		(1) 450m		
1315 (NSW)		(1) 186m		
1317 (NSW)		(1) 160m		
Total NSW		**5726m**	**625m**	**2775m**
1002A (ACT)		(2) 245		
1003 (ACT)	50m	(4) 168	41m	560m
1003A (ACT)		(2) 71m		154m

Block (Property) No.	Condition (distances in metres)			
	Disturbed	Poor	Moderate	Good
		(3) 664m		
1003B (ACT)		(3) 157m	216m	526m
1006 (ACT)				144m
Road Easement (ACT)		(2) 13m (4) 12m	30m	
Total ACT	**50m**	**1330m**	**287m**	**1384m**
Total pipeline length (ACT & NSW)	**50m**	**7056m**	**912**	**4159m**

7 Vegetation condition and variability

For the most part, vegetation across the proposed pipeline corridor, and more discretely within each block in the NSW component of the pipeline, has been influenced to varying degrees by past and present land management practices, including vegetation clearing, commercial stock grazing (high and low intensity), native macropod and feral rabbit grazing; cropping, pasture improvement and nature conservation.

Prior to February 2010, drought conditions had had a significant limiting effect on the vigour of individual plants and the condition of vegetation across most parts of the proposed pipeline corridor. Combined grazing pressures (stock, macropods and rabbits) quickly eliminated any new palatable foliage and further reduced the apparent condition of the vegetation. The onset of higher rainfall in the early part of 2010 and its subsequent continuation through to the present has had a positive effect on soil moisture and the amount of foliage growth of many herbaceous species, particularly grasses (both native and non-native). This contrasts with previous seasons where the herbaceous groundcover on some blocks (i.e. 1102) was generally sparse and heavily grazed to only a few cm in height.

A case in point is the southern portion of Block 1102, which initially comprised a low abundance of tussock grasses and forbs and was categorised as poor to moderate in condition. While the community met the TSC Act definition of BGGW it did not fulfil the EPBC Act minimum requirement. The assessment on 21 February 2011 revealed an estimated foliage cover of up to 80% of native tussock grasses, including Spear grass *Austrostipa bigeniculata*, *Panicum effusum*, *Austrodanthonia* spp. *Bothriochloa macra* and occasionally *Themeda australis* to about 1 m in height. There was also a moderate diversity of native forb species (some obscured by foliage cover) that were either not obvious or observed at very low densities during the original EA. There is a reasonable probability that this portion of Block 1102 would now rank as moderate in condition.

Three other Blocks in NSW also had their condition rank elevated as a result of the 21 February 2011 assessment, they are 1203, 1223 and a small proportion of 1217. Vegetation on 1203 and 1223 while remaining in poor condition was ranked sub-category 2, which was a better reflection of the mixed

quality of the groundcover that was now apparent. The front portion of Block 1217 was inaccurately mapped in the original EA and should have been categorised as BGGW in good condition.

The consequence of this is that the vegetation condition within any one particular paddock or block at any particular time is dependent upon the interplay of a range of factors, some of which are mentioned above. The exception being where vegetation has been converted to crop production and soil has been tilled, cultivated for stock crops (i.e. phalaris, oats) and the soil fertility increased with introduced legumes (i.e. clovers) and/or fertilizer. This was typical of many of the properties east of the Gibraltar 'saddle'.

Within the ACT component of the pipeline the effects of land management on groundcover vegetation were most apparent on Blocks 1003A and 1003B. The former block exhibited low species diversity, high proportion of non-native grass and forb, was heavily grazed at the time of the EA surveys and had probably been fertilised on a number of occasions. In contrast, Block 1003B (and 1006) despite having a history of stock grazing (which is unlikely to have been sustained high intensity) exhibited a high relative diversity of grass and forb species, low soil disturbance and maintenance and recruitment of upper canopy species.

Block 1003B also contained the larger proportion of moderate to good condition Box Gum Grassy Woodland.

Moderate to good condition *Themeda australis* grasslands (Natural Temperate Grassland) were typically found on Block 1003 (and in the western corner of Block 1003A). This area has, due to its condition and high forb diversity, been incorporated into the Murrumbidgee River Corridor reserve system and is now excluded from unregulated stock grazing.

8 Implications for rehabilitation

Groundcover vegetation identified as moderate to good in condition should be rehabilitated to the highest possible standard, with species of locally indigenous grass species selected from the following: *Austrostipa bigeniculata*, *Austrostipa scabra*, *Austrodanthonia carphoides*, *Austrodanthonia* spp., *Panicum effusum*, *Themeda australis*, *Elymus scaber*, *Chloris truncata*, *Microlaena stipoides*, *Bothriochloa macra*) and a cross section of native forbs including amongst others nitrogen fixing legumes from the family Fabaceae: i.e. *Desmodium varians*, *Glycine* spp., *Zornia dyctiocarpa*, *Lotus australis*, *Cullen tenax* and *Swainsona* sp.

Seed from some of the above mentioned species may be difficult to collect. As such, the following species may be considered as alternatives: *Bracteantha viscosa* (*Xerochrysum viscosum*), *Chrysocephalum apiculatum, Wahlenbergia* spp., *Convolvulus erubescens and Vittadinia cuneata.*

Poor condition vegetation in sub-category 2 and 3 that contain mixed grassy groundcovers would require the recovery of predominately disturbance and grazing tolerant native grasses such as *Austrostipa bigeniculata*, *Austrostipa scabra*, *Austrodanthonia carphoides*, *Bothriochloa macra*, *Austrodanthonia* spp. and *Panicum effusum*. The re-establishment of other native herbaceous species with low grazing tolerance such as *Themeda australis* and other forbs in these areas should be considered with respect to future land use and grazing regimes.

Previously tilled or sown blocks (poor condition sub-category 1) should be replanted with the appropriate pasture species.

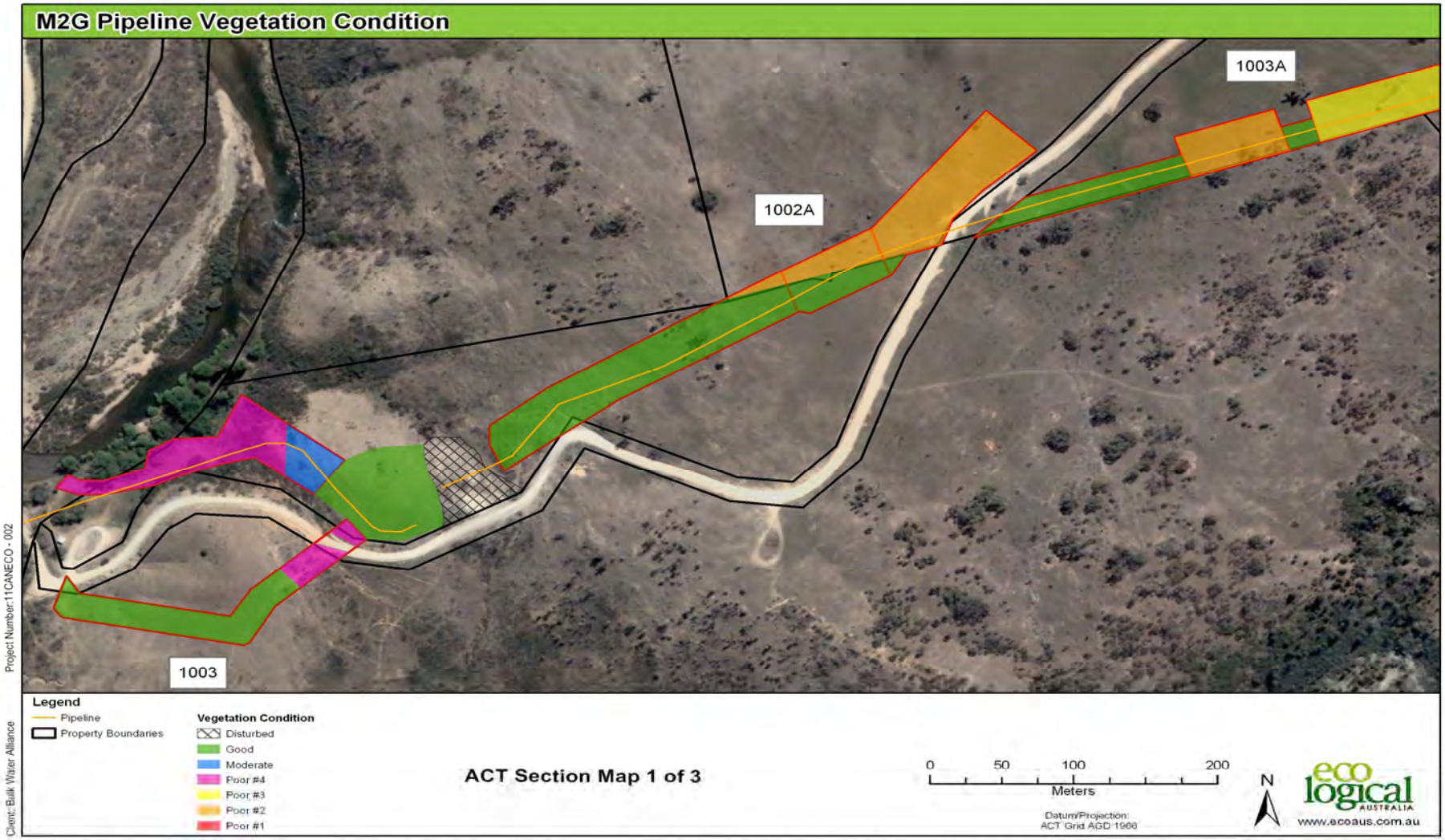

Figure 1: Western Section (ACT)

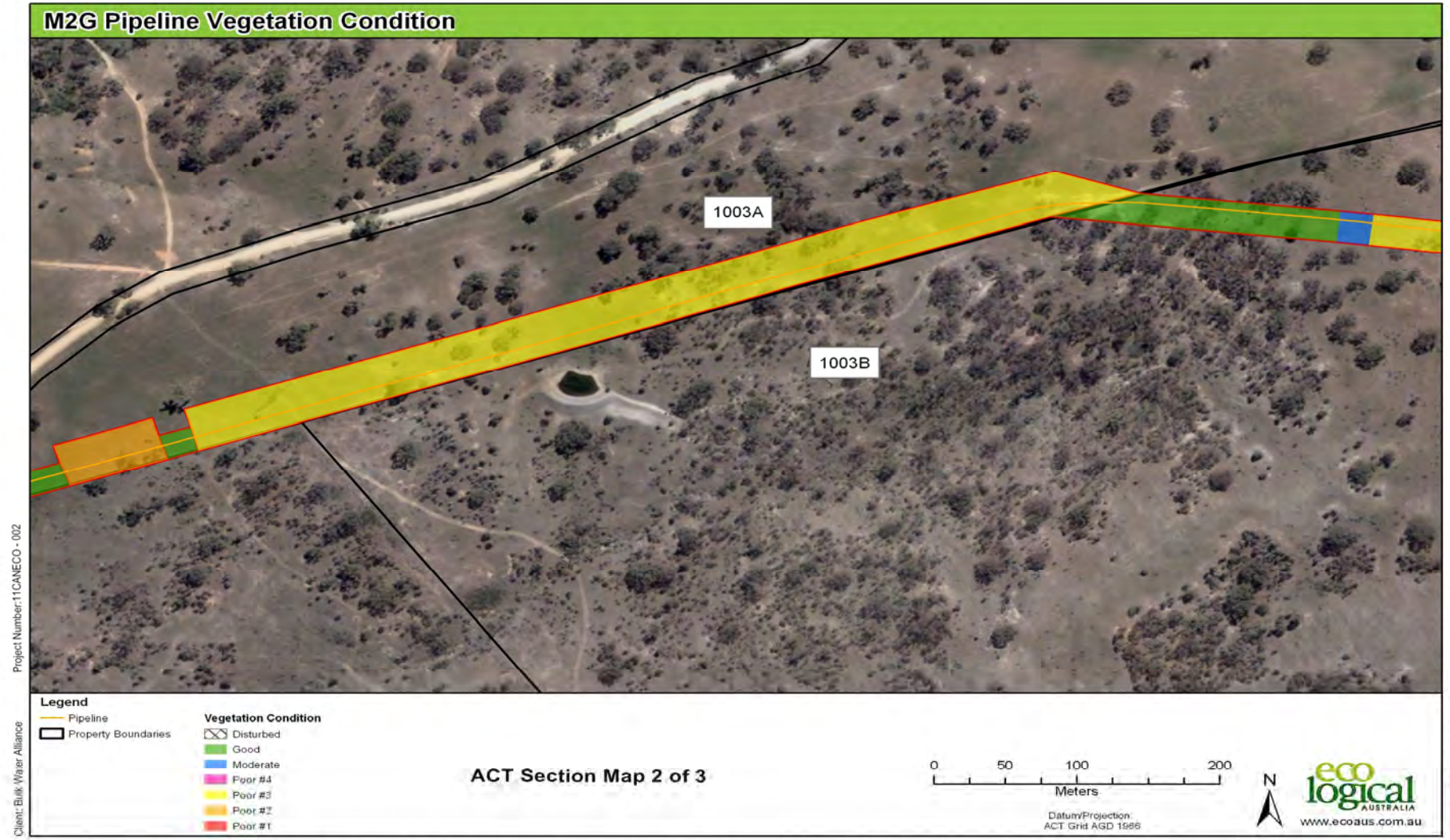

Figure 2: Central Section (ACT)

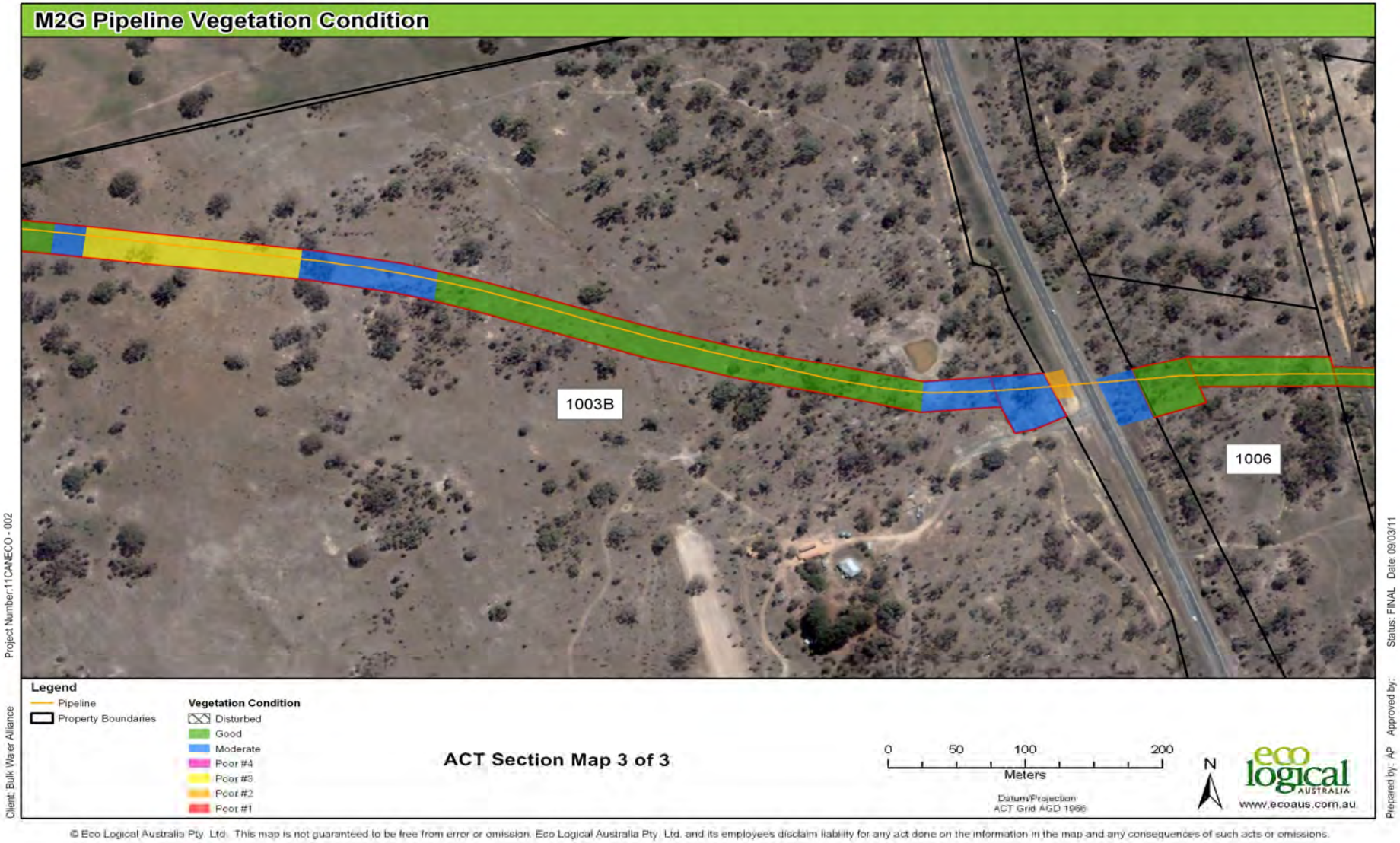

Figure 3: Eastern Section (ACT)

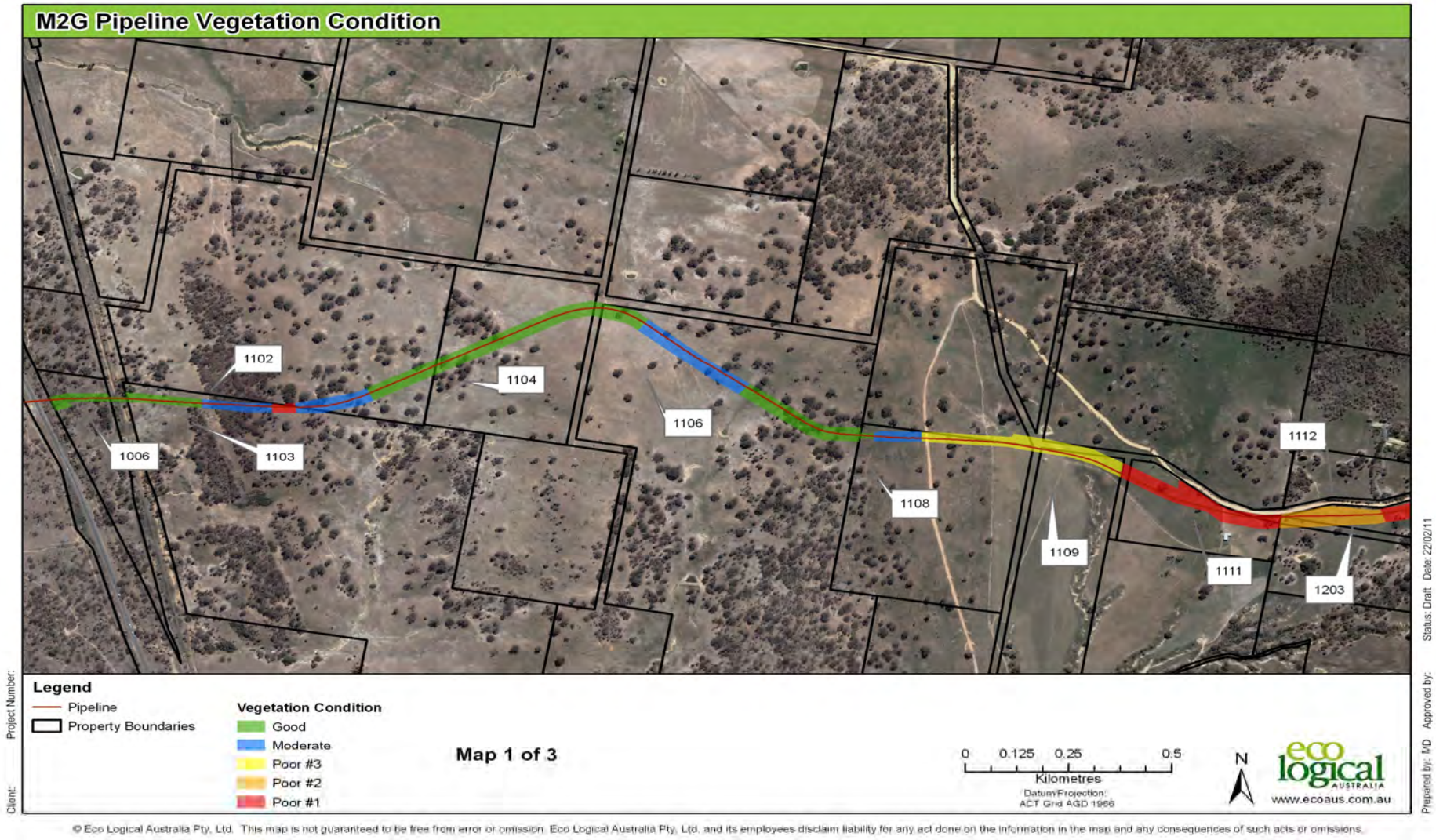

Figure 4: Western Section (NSW)

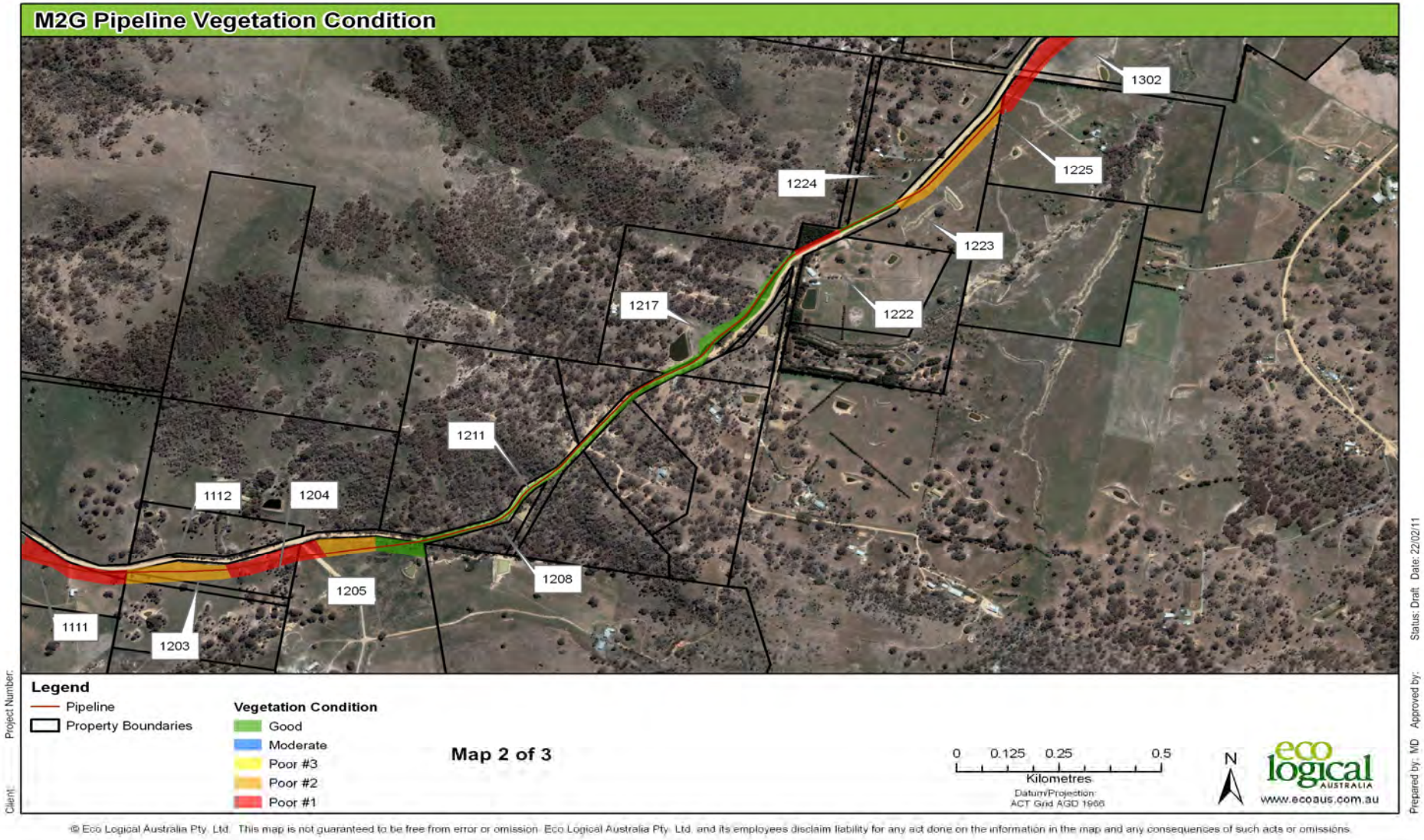

Figure 5: Central Section (NSW)

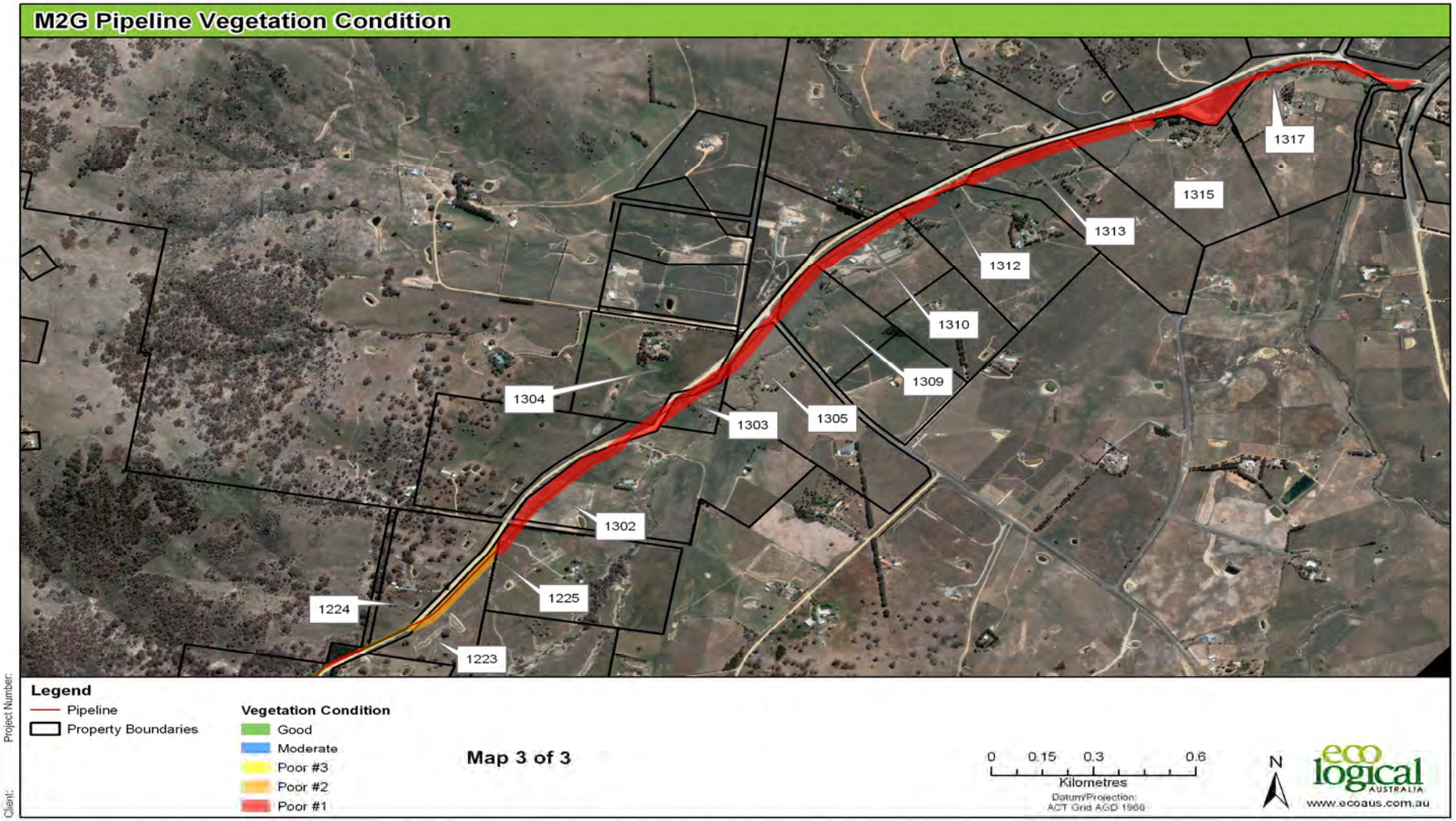

Figure6: Eastern Section (NSW)

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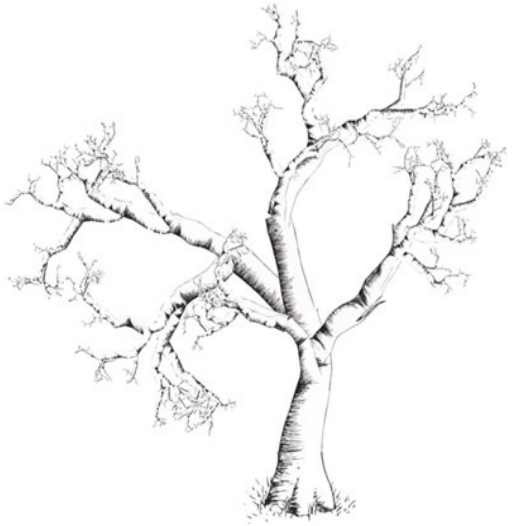
Appendix G **M2G Tree Clearing Procedure**

M2G Pipeline Hollow Bearing Tree Clearing Procedure

- Mark all hollow bearing trees **(as per Hollow Bearing Tree Procedure)**

Step 1	**Step 2**
- Clear non-hollow bearing trees - Habitat trees will be left overnight from the time of felling of the non-habitat trees nearby to help scare fauna that may be inhabiting any potential habitat trees	- Habitat trees will be inspected with binoculars to determine occupancy. - Habitat trees will be felled gently (by skilled operators), and trees will be left for a short period of time on the ground giving any fauna trapped in the trees an opportunity to escape. - Hollows will further be inspected to check for fauna. Remaining fauna will be trapped. Non-injured fauna will be recorded (sex, condition) and ear tagged and radio-collared before further processing of the trees. Fauna rescue personnel will be available to assist with injured fauna.



- > 500mm – reused as firewood / slabs for local landholders / community groups
- 300-500mm – retain as habitat – coarse woody debris
- <300mm – woodchip / mulch

- Timber to be offered to local landholders or community groups
- Retained timber will be placed within the pipeline or in adjacent properties
- Woodchip / mulch – stockpiled to be used for landscaping / erosion and sediment control.