APPENDIX 1: DIRECTOR GENERAL'S REQUIREMENTS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

NSW GOVERNMENT Planning & Infrastructure

Major Projects Assessment
Mining & Industry Projects
Contact: Kane Winwood
Phone: 9228 6298
Fax: 9228 6466
Email: kane.winwood@planning.nsw.gov.au

Our Ref: 11/22089-1

Mr Ian Chalmers
Australian Zirconia Limited
PO Box 4384
VICTORIA PARK WA 6979

Dear Mr Chalmers

State Significant Development - Director-General's Requirements
Dubbo Zirconia Project (SSD-5251)

I have attached a copy of the Director General's environmental assessment requirements (DGRs) for the preparation of an Environmental Impact Statement (EIS) for the Dubbo Zirconia Project.

These requirements are based on the information you have provided to date and have been prepared in consultation with relevant government agencies and the affected council. Their comments, which you should address appropriately in preparing the EIS, are also attached (see Attachment 2). Please note that the Department may alter these requirements at any time, and that you must consult further with the Department if you do not lodge a development application and EIS for the project within two years of the date of issue of these DGRs. The Department will review the EIS for the project carefully before putting it on public exhibition, and will require you to submit an amended EIS if it does not adequately address the DGRs.

I wish to emphasise the importance of effective and genuine community consultation and the need for proposals to proactively respond to the community's concerns. Accordingly a comprehensive, detailed and genuine community consultation and engagement process must be undertaken during preparation of the EIS. This process must ensure that the community, including key special interest, is both informed of the proposal and is actively engaged in issues of concern to them. Sufficient information must be provided to the community so that it has a good understanding of what is being proposed and of the potential impacts.

Your project may require separate approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Department encourages you to confirm whether such an approval will be required as soon as possible. If an EPBC Act approval is required, I would appreciate it if you would advise the Department accordingly, as the Commonwealth approval process may be integrated into the NSW approval process, and supplementary DGRs may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit the development application and EIS for your project. This will enable the Department to:

- confirm the applicable fee (see Division 1AA, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- determine the number of copies (hard-copy and CD-ROM) of the EIS required for review.

If you have any enquiries about these requirements, please contact Kane Winwood.

Yours sincerely

4/5/12

David Kitto
Director
Mining and Industry Projects
Delegate of the Director-General

Major Projects Assessment 23-33 Bridge St Sydney NSW 2000 GPO Box 39 Sydney NSW 2001Phone 02 9228 6111
Fax 02 9228 6455 Website planning.nsw.gov.au

Director General's Environmental Assessment Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

State Significant Development

Application Number	SSD 5251
Development	The Dubbo Zirconia Project, which includes: • developing an open cut Zirconium and rare earth mine and associated infrastructure, including water pipeline, gas pipeline, electricity transmission line, rail loading facility, rail upgrade and road upgrade; • extracting and processing approximately 18 million tonnes of ore over a period of up to 20 years; • transporting the processed ore from the mine via road and rail; and • rehabilitating the site.
Location	Toongi, 25 km south of Dubbo, in the Dubbo LGA
Applicant	Australian Zirconia Limited
Date of Issue	4 May 2012
General Requirements	The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. In addition, the EIS must include a: • detailed description of the development, including: – need for the proposed development; – justification for the proposed mine plan, including efficiency of resource recovery, mine safety, and environmental protection; – likely staging of the development - including construction, operational stage/s and rehabilitation; – likely interactions between the development and existing, approved and proposed mining operations in the vicinity of the site; – plans of any proposed building works; • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: – a description of the existing environment, using sufficient baseline data; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and – a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and • consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.
Key issues	The EIS must address the following specific issues: • **Land Resources** - including a detailed assessment of the potential impacts on: - soils and land capability (including salinisation and contamination); - landforms and topography; and - land use, including agricultural use; • **Water Resources** – including: - detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including: o detailed modelling of potential groundwater impacts; o impacts on affected licensed water users and basic landholder

	rights; and o impacts on riparian, ecological, geomorphological and hydrological values of watercourses, including environmental flows; - a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures; - an assessment of proposed water discharge quantities and quality/ies against receiving water quality and flow objectives; - an assessment of proposed modifications to surface water management, including modelling the redistribution of waters and an assessment of the impact on neighbouring properties and the associated watercourse and floodplain; - identification of any licensing requirements or other approvals under the *Water Act 1912* and/or *Water Management Act 2000*; - demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP); - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo; and - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; • **Air Quality** – including a quantitative assessment of potential: - construction and operational impacts, with a particular focus on dust emissions (including $PM_{2.5}$ and PM_{10} emissions) and processing emissions; - reasonable and feasible mitigation measures to minimise dust and processing emissions, including evidence that there are no such measures available other than those proposed; and - monitoring and management measures, in particular real-time air quality monitoring; • **Greenhouse Gases** – including: - a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions; - a qualitative assessment of the potential impacts of these emissions on the environment; and - an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency; • **Waste** – including: - accurate estimates of the quantity and nature of the potential waste streams of the development, including tailings, coarse reject and acid-generating potential; - a tailings and coarse reject disposal strategy; and - a description of measures that would be implemented to minimise production of other waste, and ensure that that waste is appropriately managed; • **Hazards and Risks** – including a screening of potential hazards off and on site to determine the potential for offsite impacts and if a Preliminary Hazard Analysis (PHA) is required. If required, a PHA must be prepared in accordance with the *Department's Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* and must: - consider the risks from the proposal; and - demonstrate that the proposal would comply with the criteria set out in *Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning*; • **Biodiversity** – including: - measures taken to avoid, reduce or mitigate impacts on biodiversity; - accurate estimates of proposed vegetation clearing; - a detailed assessment of potential impacts of the development on any: o terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities and groundwater dependent ecosystems; and o regionally significant remnant vegetation, or vegetation corridors; - a comprehensive offset strategy to ensure the development maintains

	or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term; • **Heritage** – including: - an Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must: o demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; and o outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); and - a Historic heritage assessment (including archaeology) which must: o include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items; and o outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); • **Noise** – including a quantitative assessment of potential: - construction, operational and transport noise impacts; - reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and - monitoring and management measures, in particular real-time, attended noise monitoring and predictive meteorological forecasting; • **Traffic & Transport** – including: - accurate predictions of the road and rail traffic generated by the project; - an assessment of the capacity of the rail network to accommodate the transport of ore; - an assessment of potential traffic impacts on the safety and efficiency of the road network; and - a detailed description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road and rail networks in the surrounding area over the life of the project; • **Visual** – including: - a detailed assessment of the: o changing landforms on the site during the various stages of the project; and o potential visual impacts of the project on private landowners in the surrounding area as well as key vantage points in the public domain, including lighting impacts; and - a detailed description of the measures that would be implemented to minimise the visual impacts of the project; • **Social & Economic** – including an assessment of the: - potential direct and indirect economic benefits of the project for local and regional communities and the State; - potential impacts on local and regional communities, including: o increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and o impacts on social amenity; - a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the project, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism; and - a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community; and • **Rehabilitation** – including the proposed rehabilitation strategy for the site, having regard to the key principles in the Strategic Framework for Mine Closure, including: - rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; - nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and - the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.

Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*. These documents should be included as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with the: • Commonwealth Department of Sustainability, Environment, Water, Population and Communities; • Office of Environment and Heritage (including the Heritage Branch); • Environment Protection Authority; • Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services; • Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)); • Transport for NSW (including the Centre for Transport Planning, and Roads and Maritime Services); • TransGrid; • Central West Catchment Management Authority; and • Dubbo City Council. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge a DA and an EIS for the development within 2 years of the issue date of these DGRs, you must consult further with the Director-General in relation to the requirements for lodgement.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.

ATTACHMENT 1
Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au
http://www.bookshop.nsw.gov.au
http://www.publications.gov.au

Policies, Guidelines & Plans

Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land Resources	
	Agricultural Impact Assessment Guidelines 2012 (DP&I)
	Agfact AC25: Agricultural Land Classification (NSW Agriculture)
	State Environmental Planning Policy No. 55 – Remediation of Land
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
Biodiversity	
	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW 2009)
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DECC 2004)
	Threatened Species Assessment Guidelines: the Assessment of Significance (DECC 2007)
	Guidelines for Threatened Species Assessment (DoP 2005)
	BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW 2008)
	NSW State Groundwater Dependent Ecosystem Policy (DLWC)
	Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)
	Policy & Guidelines - Fish Friendly Waterway Crossings (NSW Fisheries)
	State Environmental Planning Policy No. 44 – Koala Habitat Protection
Water Resources	
Surface Water	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC)
	National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)
	State Water Management Outcomes Plan
	Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009
	NSW Government Water Quality and River Flow Objectives (DECC)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)
	Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries.
	Managing Urban Stormwater: Treatment Techniques (DECC)
	Managing Urban Stormwater: Source Control (DECC)
	Floodplain Development Manual (DIPNR)
	Floodplain Risk Management Guideline (DECC)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

	Technical Guidelines: Bunding & Spill Management (DECC)
	Environmental Guidelines: Use of Effluent by Irrigation (DECC)
Groundwater	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC, 1997)
	NSW State Groundwater Quality Protection Policy (DLWC, 1998)
	NSW State Groundwater Quantity Management Policy (DLWC, 1998)
	Murray-Darling Basin Groundwater Quality. Sampling Guidelines. Technical Report No 3 (MDBC)
	Murray-Darling Basin Commission. Groundwater Flow Modelling Guideline (Aquaterra Consulting Pty Ltd)
	Guidelines for the Assessment & Management of Groundwater Contamination (DECC, 2007)
	Any relevant Water Sharing Plan for groundwater and surface water resources
Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)
Noise & Blasting	
	NSW Industrial Noise Policy (DECC)
	Environmental Noise Management – Assessing Vibration: a technical guide (DEC)
	NSW Road Noise Policy (DECCW)
	Interim Guidelines for the Assessment of Noise From Rail Infrastructure Projects (DECC)
	Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC)
Traffic & Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Heritage	
Aboriginal	Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Historic	NSW Heritage Manual (NSW Heritage Office)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Greenhouse Gases	
	National Greenhouse Accounts Factors (Australian Department of Climate Change (DCC))
	Guidelines for Energy Savings Action Plans (DEUS)
Waste	
	Waste Classification Guidelines (DECC)
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous and Offensive Development Application Guidelines - Applying SEPP 33
	Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis

Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Strategic Framework for Mine Closure (ANZMEC-MCA)
Socio-Economic	
	Draft Economic Evaluation in Environmental Impact Assessment (DoP)
	Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)

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

Mr Kane Winwood
Team Leader
Mining Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Date: 14 February 2013
EPBC Ref: 2012/6225
EPBC contact: Mark Jenkins
02 6274 1558
mark.jenkins@environment.gov.au

Dear Mr Winwood

Requirements for accredited assessment process
Dubbo Zirconia Project, Toongi, NSW

I refer to your request of 7 January 2013 for the Department of Sustainability, Environment, Water, Population and Communities' input into the Director-General's requirements for environmental assessment for the above proposal, determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 4 January 2013.

I have enclosed the Commonwealth's requirements for the assessment. I note that in accordance with the *Environmental Planning and Assessment Act 1979* you are required to notify the proponent of these requirements.

I also note that the interim administrative procedures that applied to Part 3A assessments in relation to accredited assessment processes will apply to this accredited assessment process.

If you have any questions about the enclosed requirements, please contact the EPBC project manager and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

James Tregurtha
Assistant Secretary
South-Eastern Australia Environment Assessments

GPO Box 787 Canberra ACT 2601 Telephone 02 6274 1111 Facsimile 02 6274 1666
www.environment.gov.au

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

Environment Assessment Requirements for input into the Director-General Requirements Dubbo Zirconia Project, Toongi, NSW (EPBC 2012/6625)

The delegate for the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities has declared the proposal to develop an open cut mine to extract ore containing the rare metals Zirconium, Niobium and Yttrium and Rare Earth Elements near the village of Toongi, New South Wales (EPBC 2012/6625) to be a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it is likely to have a significant impact on:

- Listed threatened species and communities (sections 18 & 18A) including the Pink-tailed Worm-Lizard (*Aprasia parapulchella*).

The delegate has also determined that the project be assessed through an Accredited Assessment as an Environmental Impact Statement under the *NSW Environmental Planning and Assessment Act 1979*. In accordance with the accredited assessment process for this project, the assessment of the impacts of the action on the relevant matters of national environmental significance must be integrated into the assessment required for Part 4 of the EP&A Act. The assessment must include enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities, or his delegate, to make an informed decision about whether or not to approve the controlled action under the EPBC Act. To this end, provided below are the Environment Assessment requirements under the EPBC Act for input into the Director-General Requirements. The Director-General is required to notify the proponent of these requirements.

The following matters must be addressed in the Environmental Assessment of the action:

Key assessment requirements

(1) Impacts on threatened species and ecological communities listed under Sections 18 and 18A of the *Environment Protection and Biodiversity Conservation Act 1999*;
(2) Any relevant Commonwealth and State Government technical and policy guidelines;
(3) Matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulation 2000*, included in the requirements below; and
(4) The requirements outlined below:

1. General information

The background of the action including:

(a) the title of the action;

(b) the full name and postal address of the designated proponent;

(c) a clear outline of the objective of the action;

(d) the location of the action;

(e) the background to the development of the action;

(f) how the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;

(g) the current status of the action; and

(h) the consequences of not proceeding with the action.

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

2. Description of the action

A description of the action, including:

(a) all the components of the action;

(b) the precise location of the preferred option for any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;

(c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;

(d) to the extent reasonably practicable, a description of any feasible alternatives to the controlled action that have been identified through the assessment, and their likely impact, including:

(i) if relevant, the alternative of taking no action;

(ii) a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action; and

(iii) sufficient detail to make clear why any alternative is preferred to another.

(e) A description of long-term and short-term economic and social considerations regarding the project.

3. A description of the existing environment and relevant matters of national environmental significance;

Listed threatened species and ecological communities

a) a description of the nature, location and extent of all vegetation types occurring on the site, immediately adjacent to the site and in areas likely to be indirectly impacted by the action;
b) a description and map of the nature, location and extent of likely suitable habitat, and known records for, threatened species and ecological communities (including breeding, foraging, roosting habitat, habitat critical to the survival of the relevant species and ecological communities, movement corridors and migration paths) within the sites and in surrounding areas that may be impacted by the proposal; and
c) adequate surveys for relevant species, including detailed description of the methodology, timing, effort and results of all targeted surveys undertaken for all relevant matters, in accordance with any relevant guidelines and a description of any limitations and constraints of the surveys undertaken.

4. A description of the relevant impacts of the action;

An assessment of the relevant impacts of the action, including:

a) a detailed description and assessment of the nature and extent of all relevant impacts, including direct, indirect and facilitated impacts that the action will have or is likely to have on listed threatened species and ecological communities listed under sections 18 and 18A of the EPBC Act;
b) whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
c) any technical data and other information used or needed to make a detailed assessment of the relevant impacts, as they relate to relevant matters of national environmental significance.

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

5. Proposed safeguards, mitigation and offset measures

A description of changes to the action and feasible mitigation measures, that are intended to avoid, minimise or compensate for relevant impacts, including:

a) a description of how the action has been designed to avoid impacts to threatened species and ecological communities;
b) a consolidated list of mitigation measures proposed to be undertaken to prevent or minimise the relevant impacts of the action, before, during and after construction, during operation, decommissioning and rehabilitation;
c) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures, including a justification of the location and design of mitigation measures to be implemented to ensure their effectiveness. This analysis should be based on best available knowledge and baseline data for the relevant areas;
d) a description of the objectives of the mitigation measures, thresholds for corrective actions, and the corrective actions to be implemented should these thresholds be exceeded;
e) any statutory or policy basis for the mitigation measures;
f) details of environmental management plans that set out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including the person or agency responsible for implementing these programs and provisions for independent environmental auditing;
g) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;
h) in the event that impacts cannot be avoided or mitigated, a description of any offsets to compensate for any predicted or potential residual impacts on threatened species and ecological communities. This should be in accordance with the department's Offsets Policy (http://www.environment.gov.au/epbc/publications/environmental-offsets-policy.html) and include:
    i. an assessment of how any proposed offset compensates for the residual impacts on threatened species and ecological communities likely to remain following avoidance and mitigation measures to be implemented;
    ii. the location of any proposed offset;
    iii. the timing of the delivery of any offset; and
    iv. how the offset will be secured and managed in perpetuity.

6. Other approvals and conditions

Any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action. Information must include:

(a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

(i) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy; and

(ii) how the scheme provides for the prevention, minimisation and management of any relevant impacts.

(b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the relevant Act) including any conditions that apply to the action;

(c) a statement identifying any additional approval that is required; and

(d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

7. Environmental record of person proposing to take the action

A description of the environmental record of the person proposing to take the action, including:

a) Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:
   i. the person proposing to take the action; and
   ii. for an action for which a person has applied for a permit, the person making the application.
b) If the person proposing to take the action is a corporation — details of the corporation's environmental policy and planning framework.

8. Information sources

For information given in an environment assessment, the draft must state:

(a) the source of the information;

(b) how recent the information is;

(c) how the reliability of the information was tested; and

(d) what uncertainties (if any) are in the information.

9. Consultation

A description of any consultation undertaken during the assessment, including:

a) Any consultation about the action, including:
   i. any consultation that has already taken place;
   ii. proposed consultation about relevant impacts of the action; and
   iii. if there has been consultation about the proposed action — any documented response to, or result of, the consultation.
b) Identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

10. Economic and Social Matters

The economic and social impacts of the action, both positive and negative, must be analysed. This analysis must include:

a) details of any public consultation activities undertaken, and their outcomes;
b) projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies; and
c) employment opportunities expected to be generated by the project (including construction and operational phases).

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

Appendix A

The Pink-tailed Worm-Lizard (*Aprasia parapulchella*)

The following information regarding the Pink-tailed Worm-Lizard (PTWL) should be included in the EIS, preferably in the proposed PTWL Management Plan:

- A map depicting the locations of subpopulations of the PTWL on the site in relation to the proposed open cut mine, other infrastructure and proposed offset areas.
- Estimates of the number of individuals in each subpopulation and the area of PTWL habitat which will be lost at each location.
- Analysis of the measures proposed in the referral to reduce potential impacts on the PTWL such as the proposed PTWL monitoring and research program, including analysis of the risks and potential benefits of translocation, the provision of offset areas and additional research and field work.
- The success or failure of PTWL management programs at other sites should be discussed in detail to assist consideration of the management and mitigation measures proposed for the Toongi Zirconia site.

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

Environment Assessment Requirements for input into the Director-General Requirements Dubbo Zirconia Project, Toongi, NSW (EPBC 2012/6625)

The delegate for the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities has declared the proposal to develop an open cut mine to extract ore containing the rare metals Zirconium, Niobium and Yttrium and Rare Earth Elements near the village of Toongi, New South Wales (EPBC 2012/6625) to be a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it is likely to have a significant impact on:

- Listed threatened species and communities (sections 18 & 18A) including the Pink-tailed Worm-Lizard (*Aprasia parapulchella*).

The delegate has also determined that the project be assessed through an Accredited Assessment as an Environmental Impact Statement under the *NSW Environmental Planning and Assessment Act 1979*. In accordance with the accredited assessment process for this project, the assessment of the impacts of the action on the relevant matters of national environmental significance must be integrated into the assessment required for Part 4 of the EP&A Act. The assessment must include enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities, or his delegate, to make an informed decision about whether or not to approve the controlled action under the EPBC Act. To this end, provided below are the Environment Assessment requirements under the EPBC Act for input into the Director-General Requirements. The Director-General is required to notify the proponent of these requirements.

The following matters must be addressed in the Environmental Assessment of the action:

Key assessment requirements

(1) Impacts on threatened species and ecological communities listed under Sections 18 and 18A of the *Environment Protection and Biodiversity Conservation Act 1999*;
(2) Any relevant Commonwealth and State Government technical and policy guidelines;
(3) Matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulation 2000*, included in the requirements below; and
(4) The requirements outlined below:

1. General information

The background of the action including:

(a) the title of the action;

(b) the full name and postal address of the designated proponent;

(c) a clear outline of the objective of the action;

(d) the location of the action;

(e) the background to the development of the action;

(f) how the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;

(g) the current status of the action; and

(h) the consequences of not proceeding with the action.

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

2. Description of the action

A description of the action, including:

(a) all the components of the action;

(b) the precise location of the preferred option for any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;

(c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;

(d) to the extent reasonably practicable, a description of any feasible alternatives to the controlled action that have been identified through the assessment, and their likely impact, including:

(i) if relevant, the alternative of taking no action;

(ii) a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action; and

(iii) sufficient detail to make clear why any alternative is preferred to another.

(e) A description of long-term and short-term economic and social considerations regarding the project.

3. A description of the existing environment and relevant matters of national environmental significance;

Listed threatened species and ecological communities

a) a description of the nature, location and extent of all vegetation types occurring on the site, immediately adjacent to the site and in areas likely to be indirectly impacted by the action;
b) a description and map of the nature, location and extent of likely suitable habitat, and known records for, threatened species and ecological communities (including breeding, foraging, roosting habitat, habitat critical to the survival of the relevant species and ecological communities, movement corridors and migration paths) within the sites and in surrounding areas that may be impacted by the proposal; and
c) adequate surveys for relevant species, including detailed description of the methodology, timing, effort and results of all targeted surveys undertaken for all relevant matters, in accordance with any relevant guidelines and a description of any limitations and constraints of the surveys undertaken.

4. A description of the relevant impacts of the action;

An assessment of the relevant impacts of the action, including:

a) a detailed description and assessment of the nature and extent of all relevant impacts, including direct, indirect and facilitated impacts that the action will have or is likely to have on listed threatened species and ecological communities listed under sections 18 and 18A of the EPBC Act;
b) whether any relevant impacts are likely to be unknown, unpredictable or irreversible;
c) any technical data and other information used or needed to make a detailed assessment of the relevant impacts, as they relate to relevant matters of national environmental significance.

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

5. Proposed safeguards, mitigation and offset measures

A description of changes to the action and feasible mitigation measures, that are intended to avoid, minimise or compensate for relevant impacts, including:

a) a description of how the action has been designed to avoid impacts to threatened species and ecological communities;
b) a consolidated list of mitigation measures proposed to be undertaken to prevent or minimise the relevant impacts of the action, before, during and after construction, during operation, decommissioning and rehabilitation;
c) a description, and an assessment of the expected or predicted effectiveness of, the mitigation measures, including a justification of the location and design of mitigation measures to be implemented to ensure their effectiveness. This analysis should be based on best available knowledge and baseline data for the relevant areas;
d) a description of the objectives of the mitigation measures, thresholds for corrective actions, and the corrective actions to be implemented should these thresholds be exceeded;
e) any statutory or policy basis for the mitigation measures;
f) details of environmental management plans that set out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including the person or agency responsible for implementing these programs and provisions for independent environmental auditing;
g) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;
h) in the event that impacts cannot be avoided or mitigated, a description of any offsets to compensate for any predicted or potential residual impacts on threatened species and ecological communities. This should be in accordance with the department's Offsets Policy (http://www.environment.gov.au/epbc/publications/environmental-offsets-policy.html) and include:
    i. an assessment of how any proposed offset compensates for the residual impacts on threatened species and ecological communities likely to remain following avoidance and mitigation measures to be implemented;
    ii. the location of any proposed offset;
    iii. the timing of the delivery of any offset; and
    iv. how the offset will be secured and managed in perpetuity.

6. Other approvals and conditions

Any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action. Information must include:

(a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

(i) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy; and

(ii) how the scheme provides for the prevention, minimisation and management of any relevant impacts.

(b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the relevant Act) including any conditions that apply to the action;

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

(c) a statement identifying any additional approval that is required; and

(d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

7. Environmental record of person proposing to take the action

A description of the environmental record of the person proposing to take the action, including:

a) Details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:
   i. the person proposing to take the action; and
   ii. for an action for which a person has applied for a permit, the person making the application.

b) If the person proposing to take the action is a corporation — details of the corporation's environmental policy and planning framework.

8. Information sources

For information given in an environment assessment, the draft must state:

(a) the source of the information;

(b) how recent the information is;

(c) how the reliability of the information was tested; and

(d) what uncertainties (if any) are in the information.

9. Consultation

A description of any consultation undertaken during the assessment, including:

a) Any consultation about the action, including:
   i. any consultation that has already taken place;
   ii. proposed consultation about relevant impacts of the action; and
   iii. if there has been consultation about the proposed action — any documented response to, or result of, the consultation.

b) Identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

10. Economic and Social Matters

The economic and social impacts of the action, both positive and negative, must be analysed. This analysis must include:

a) details of any public consultation activities undertaken, and their outcomes;
b) projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies; and
c) employment opportunities expected to be generated by the project (including construction and operational phases).

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

Appendix A

The Pink-tailed Worm-Lizard (*Aprasia parapulchella*)

The following information regarding the Pink-tailed Worm-Lizard (PTWL) should be included in the EIS, preferably in the proposed PTWL Management Plan:

- A map depicting the locations of subpopulations of the PTWL on the site in relation to the proposed open cut mine, other infrastructure and proposed offset areas.
- Estimates of the number of individuals in each subpopulation and the area of PTWL habitat which will be lost at each location.
- Analysis of the measures proposed in the referral to reduce potential impacts on the PTWL such as the proposed PTWL monitoring and research program, including analysis of the risks and potential benefits of translocation, the provision of offset areas and additional research and field work.
- The success or failure of PTWL management programs at other sites should be discussed in detail to assist consideration of the management and mitigation measures proposed for the Toongi Zirconia site.

This page has been left intentionally blank

APPENDIX 2: DATABASE SEARCHES*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

OEH THREATENED SPECIES DATABASE SEARCH

Central West (Talbragar Valley) CMA 94 species

Scientific name	Common name	Type of species	NSW status	Occurrence
Crinia sloanei	Sloane's Froglet	Animal > Amphibians	Vulnerable	Predicted
Chalinolobus dwyeri	Large-eared Pied Bat	Animal > Bats	Vulnerable	Predicted
Chalinolobus picatus	Little Pied Bat	Animal > Bats	Vulnerable	Known
Nyctophilus timoriensis (South-eastern form)	Greater Long-eared Bat	Animal > Bats	Vulnerable	Known
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Animal > Bats	Vulnerable	Known
Anseranas semipalmata	Magpie Goose	Animal > Birds	Vulnerable	Known
Burhinus grallarius	Bush Stone-curlew	Animal > Birds	Endangered	Known
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Animal > Birds	Vulnerable	Predicted
Calyptorhynchus lathami	Glossy Black-Cockatoo	Animal > Birds	Vulnerable	Known
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Animal > Birds	Vulnerable	Known
Ephippiorhynchus asiaticus	Black-necked Stork	Animal > Birds	Endangered	Predicted
Falco hypoleucos	Grey Falcon	Animal > Birds	Endangered	Known
Grus rubicunda	Brolga	Animal > Birds	Vulnerable	Predicted
Hamirostra melanosternon	Black-breasted Buzzard	Animal > Birds	Vulnerable	Predicted
Limosa limosa	Black-tailed Godwit	Animal > Birds	Vulnerable	Predicted
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Animal > Birds	Vulnerable	Known
Ninox strenua	Powerful Owl	Animal > Birds	Vulnerable	Known
Pachycephala inornata	Gilbert's Whistler	Animal > Birds	Vulnerable	Known
Phaethon rubricauda	Red-tailed Tropicbird	Animal > Birds	Vulnerable	Known
Polytelis swainsonii	Superb Parrot	Animal > Birds	Vulnerable	Known
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Animal > Birds	Vulnerable	Known
Botaurus poiciloptilus	Australasian Bittern	Animal > Birds	Endangered	Predicted
Lathamus discolor	Swift Parrot	Animal > Birds	Endangered	Predicted
Leipoa ocellata	Malleefowl	Animal > Birds	Endangered	Known
Lophoictinia isura	Square-tailed Kite	Animal > Birds	Vulnerable	Known
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Animal > Birds	Vulnerable	Known
Neophema pulchella	Turquoise Parrot	Animal > Birds	Vulnerable	Known
Ninox connivens	Barking Owl	Animal > Birds	Vulnerable	Known
Oxyura australis	Blue-billed Duck	Animal > Birds	Vulnerable	Known
Chthonicola sagittata	Speckled Warbler	Animal > Birds	Vulnerable	Known
Rostratula australis	Australian Painted Snipe	Animal > Birds	Endangered	Known
Stagonopleura guttata	Diamond Firetail	Animal > Birds	Vulnerable	Known
Stictonetta naevosa	Freckled Duck	Animal > Birds	Vulnerable	Predicted
Tyto novaehollandiae	Masked Owl	Animal > Birds	Vulnerable	Predicted
Anthochaera phrygia	Regent Honeyeater	Animal > Birds	Critically Endangered	Known
Glossopsitta pusilla	Little Lorikeet	Animal > Birds	Vulnerable	Known
Petroica phoenicea	Flame Robin	Animal > Birds	Vulnerable	Known
Petroica boodang	Scarlet Robin	Animal > Birds	Vulnerable	Known
Hieraaetus morphnoides	Little Eagle	Animal > Birds	Vulnerable	Known
Circus assimilis	Spotted Harrier	Animal > Birds	Vulnerable	Known
Daphoenositta chrysoptera	Varied Sittella	Animal > Birds	Vulnerable	Known
Epthianura albifrons	White-fronted Chat	Animal > Birds	Vulnerable	Known
Cercartetus nanus	Eastern Pygmy-possum	Animal > Marsupials	Vulnerable	Predicted
Petaurus norfolcensis	Squirrel Glider	Animal > Marsupials	Vulnerable	Known
Phascolarctos cinereus	Koala	Animal > Marsupials	Vulnerable	Known
Sminthopsis macroura	Stripe-faced Dunnart	Animal > Marsupials	Vulnerable	Predicted

Scientific name	Common name	Type of species	NSW status	Occurrence
Dasyurus maculatus	Spotted-tailed Quoll	Animal > Marsupials	Vulnerable	Known
Macrotis lagotis	Bilby	Animal > Marsupials	Extinct	Known
Hoplocephalus bitorquatus	Pale-headed Snake	Animal > Reptiles	Vulnerable	Known
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Predicted
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Tylophora linearis	Tylophora linearis	Plant > Epiphytes and Climbers	Vulnerable	Known
Dichanthium setosum	Bluegrass	Plant > Herbs and Forbs	Vulnerable	Predicted
Calotis glandulosa	Mauve Burr-daisy	Plant > Herbs and Forbs	Vulnerable	Known
Swainsona sericea	Silky Swainson-pea	Plant > Herbs and Forbs	Vulnerable	Known
Diuris tricolor	Pine Donkey Orchid	Plant > Orchids	Vulnerable	Known
Indigofera efoliata	Leafless Indigo	Plant > Shrubs	Endangered	Known
Rulingia procumbens	Rulingia procumbens	Plant > Shrubs	Vulnerable	Known
Zieria ingramii	Keith's Zieria	Plant > Shrubs	Endangered	Known
Homoranthus darwinioides	Homoranthus darwinioides	Plant > Shrubs	Vulnerable	Known
Acacia ausfeldii	Ausfeld's Wattle	Plant > Shrubs	Vulnerable	Known
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species	Threat > Disease	Key Threatening Process	Predicted
Infection of native plants by Phytophthora cinnamomi	Infection of native plants by Phytophthora cinnamomi	Threat > Disease	Key Threatening Process	Predicted
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Threat > Disease	Key Threatening Process	Predicted
Alteration of habitat following subsidence due to longwall mining	Alteration of habitat following subsidence due to longwall mining	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Loss or degradation (or both) of sites used for hill-topping by butterflies	Loss and/or degradation of sites used for hill-topping by butterflies	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Bushrock removal	Bushrock Removal	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Clearing of native vegetation	Clearing of native vegetation	Threat > Habitat Loss/Change	Key Threatening Process	Predicted

Scientific name	Common name	Type of species	NSW status	Occurrence
Anthropogenic Climate Change	Human-caused Climate Change	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Loss of Hollow-bearing Trees	Loss of Hollow-bearing Trees	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Removal of dead wood and dead trees	Removal of dead wood and dead trees	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Ecological consequences of high frequency fires	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	Threat > Other Threat	Key Threatening Process	Predicted
Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	Introduction of the large earth bumblebee (Bombus terrestris)	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by the Feral Cat Felis catus (Linnaeus, 1758)	Predation by feral cats	Threat > Pest Animal	Key Threatening Process	Predicted
Competition from feral honey bees, Apis mellifera L.	Competition from feral honeybees	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	Invasion of the yellow crazy ant (Anoplolepis gracilipes) into NSW	Threat > Pest Animal	Key Threatening Process	Predicted
Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion and establishment of the Cane Toad (Bufo marinus)	Invasion and establishment of the Cane Toad	Threat > Pest Animal	Key Threatening Process	Predicted
Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Threat > Pest Animal	Key Threatening Process	Predicted
Herbivory and environmental degradation caused by feral deer	Herbivory and environmental degradation caused by feral deer	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	Predation by the European Red Fox	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	Predation by the Plague Minnow (Gambusia holbrooki)	Threat > Pest Animal	Key Threatening Process	Predicted
Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	Predation, habitat degradation, competition and disease transmission by Feral Pigs (Sus scrofa)	Threat > Pest Animal	Key Threatening Process	Predicted
Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	Importation of red imported fire ants into NSW	Threat > Pest Animal	Key Threatening Process	Predicted

Scientific name	Common name	Type of species	NSW status	Occurrence
Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	Competition and grazing by the feral European rabbit	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion of native plant communities by exotic perennial grasses	Invasion of native plant communities by exotic perennial grasses	Threat > Weed	Key Threatening Process	Predicted
Invasion of native plant communities by Chrysanthemoides monilifera	Invasion of native plant communities by bitou bush & boneseed	Threat > Weed	Key Threatening Process	Predicted
Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat)	Threat > Weed	Key Threatening Process	Predicted
Invasion and establishment of exotic vines and scramblers	Invasion and establishment of exotic vines and scramblers	Threat > Weed	Key Threatening Process	Predicted
Invasion and establishment of Scotch Broom (Cytisus scoparius)	Invasion and establishment of Scotch Broom (Cytisus scoparius)	Threat > Weed	Key Threatening Process	Predicted
Invasion of Native Plant Communities by African Olive Olea europaea L. subsp. cuspidata (Wall ex G.Don Ciferri)	Invasion of Native Plant Communities by African Olive Olea europaea L. subsp. cuspidata (Wall ex G.Don Ciferri)	Threat > Weed	Key Threatening Process	Predicted

Central West (Upper Slopes) CMA 104 species

Scientific name	Common name	Type of species	NSW status	Occurrence
Litoria booroolongensis	Booroolong Frog	Animal > Amphibians	Endangered	Known
Crinia sloanei	Sloane's Froglet	Animal > Amphibians	Vulnerable	Known
Chalinolobus dwyeri	Large-eared Pied Bat	Animal > Bats	Vulnerable	Known
Chalinolobus picatus	Little Pied Bat	Animal > Bats	Vulnerable	Known
Nyctophilus timoriensis (South-eastern form)	Greater Long-eared Bat	Animal > Bats	Vulnerable	Known
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Animal > Bats	Vulnerable	Known
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Animal > Bats	Vulnerable	Known
Anseranas semipalmata	Magpie Goose	Animal > Birds	Vulnerable	Predicted
Burhinus grallarius	Bush Stone-curlew	Animal > Birds	Endangered	Known
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Animal > Birds	Vulnerable	Known
Calyptorhynchus lathami	Glossy Black-Cockatoo	Animal > Birds	Vulnerable	Known
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Animal > Birds	Vulnerable	Known
Ephippiorhynchus asiaticus	Black-necked Stork	Animal > Birds	Endangered	Known
Grus rubicunda	Brolga	Animal > Birds	Vulnerable	Known
Hamirostra melanosternon	Black-breasted Buzzard	Animal > Birds	Vulnerable	Known
Limosa limosa	Black-tailed Godwit	Animal > Birds	Vulnerable	Predicted
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Animal > Birds	Vulnerable	Known
Ninox strenua	Powerful Owl	Animal > Birds	Vulnerable	Known
Pachycephala inornata	Gilbert's Whistler	Animal > Birds	Vulnerable	Known
Polytelis swainsonii	Superb Parrot	Animal > Birds	Vulnerable	Known
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Animal > Birds	Vulnerable	Known

Scientific name	Common name	Type of species	NSW status	Occurrence
Callocephalon fimbriatum	Gang-gang Cockatoo	Animal > Birds	Vulnerable	Known
Hieraaetus morphnoides	Little Eagle	Animal > Birds	Vulnerable	Known
Circus assimilis	Spotted Harrier	Animal > Birds	Vulnerable	Known
Daphoenositta chrysoptera	Varied Sittella	Animal > Birds	Vulnerable	Known
Epthianura albifrons	White-fronted Chat	Animal > Birds	Vulnerable	Known
Botaurus poiciloptilus	Australasian Bittern	Animal > Birds	Endangered	Known
Grantiella picta	Painted Honeyeater	Animal > Birds	Vulnerable	Known
Lathamus discolor	Swift Parrot	Animal > Birds	Endangered	Known
Leipoa ocellata	Malleefowl	Animal > Birds	Endangered	Known
Lophoictinia isura	Square-tailed Kite	Animal > Birds	Vulnerable	Known
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Animal > Birds	Vulnerable	Known
Neophema pulchella	Turquoise Parrot	Animal > Birds	Vulnerable	Known
Ninox connivens	Barking Owl	Animal > Birds	Vulnerable	Known
Oxyura australis	Blue-billed Duck	Animal > Birds	Vulnerable	Predicted
Pandion cristatus	Eastern Osprey	Animal > Birds	Vulnerable	Known
Chthonicola sagittata	Speckled Warbler	Animal > Birds	Vulnerable	Known
Rostratula australis	Australian Painted Snipe	Animal > Birds	Endangered	Predicted
Stagonopleura guttata	Diamond Firetail	Animal > Birds	Vulnerable	Known
Stictonetta naevosa	Freckled Duck	Animal > Birds	Vulnerable	Known
Tyto novaehollandiae	Masked Owl	Animal > Birds	Vulnerable	Known
Anthochaera phrygia	Regent Honeyeater	Animal > Birds	Critically Endangered	Known
Glossopsitta pusilla	Little Lorikeet	Animal > Birds	Vulnerable	Known
Petroica phoenicea	Flame Robin	Animal > Birds	Vulnerable	Known
Petroica boodang	Scarlet Robin	Animal > Birds	Vulnerable	Known
Cercartetus nanus	Eastern Pygmy-possum	Animal > Marsupials	Vulnerable	Predicted
Petaurus norfolcensis	Squirrel Glider	Animal > Marsupials	Vulnerable	Known
Phascogale tapoatafa	Brush-tailed Phascogale	Animal > Marsupials	Vulnerable	Predicted
Phascolarctos cinereus	Koala	Animal > Marsupials	Vulnerable	Known
Dasyurus maculatus	Spotted-tailed Quoll	Animal > Marsupials	Vulnerable	Known
Petrogale penicillata	Brush-tailed Rock-wallaby	Animal > Marsupials	Endangered	Known
Suta flagellum	Little Whip Snake	Animal > Reptiles	Vulnerable	Known
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Predicted
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Euphrasia arguta	Euphrasia arguta	Plant >	Critically Endangered	Known
Tylophora linearis	Tylophora linearis	Plant > Epiphytes and Climbers	Vulnerable	Known
Dichanthium setosum	Bluegrass	Plant > Herbs and Forbs	Vulnerable	Known
Swainsona recta	Small Purple-pea	Plant > Herbs and Forbs	Endangered	Known

Scientific name	Common name	Type of species	NSW status	Occurrence
Swainsona sericea	Silky Swainson-pea	Plant > Herbs and Forbs	Vulnerable	Known
Diuris tricolor	Pine Donkey Orchid	Plant > Orchids	Vulnerable	Known
Caladenia arenaria	Sand-hill Spider Orchid	Plant > Orchids	Endangered	Known
Caladenia tessellata	Thick Lip Spider Orchid	Plant > Orchids	Endangered	Known
Indigofera efoliata	Leafless Indigo	Plant > Shrubs	Endangered	Known
Persoonia marginata	Clandulla Geebung	Plant > Shrubs	Vulnerable	Known
Grevillea divaricata	Grevillea divaricata	Plant > Shrubs	Endangered	Predicted
Pomaderris queenslandica	Scant Pomaderris	Plant > Shrubs	Endangered	Known
Zieria obcordata	Zieria obcordata	Plant > Shrubs	Endangered	Known
Acacia ausfeldii	Ausfeld's Wattle	Plant > Shrubs	Vulnerable	Known
Eucalyptus alligatrix subsp. miscella	Eucalyptus alligatrix subsp. miscella	Plant > Trees	Vulnerable	Known
Eucalyptus cannonii	Capertee Stringybark	Plant > Trees	Vulnerable	Known
Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	Plant > Trees	Vulnerable	Known
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Threat > Disease	Key Threatening Process	Predicted
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	Infection by Psittacine circoviral (beak and feather) disease affecting endangered psittacine species	Threat > Disease	Key Threatening Process	Predicted
Infection of native plants by Phytophthora cinnamomi	Infection of native plants by Phytophthora cinnamomi	Threat > Disease	Key Threatening Process	Predicted
Alteration of habitat following subsidence due to longwall mining	Alteration of habitat following subsidence due to longwall mining	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Loss or degradation (or both) of sites used for hill-topping by butterflies	Loss and/or degradation of sites used for hill-topping by butterflies	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Removal of dead wood and dead trees	Removal of dead wood and dead trees	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Ecological consequences of high frequency fires	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Bushrock removal	Bushrock Removal	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Clearing of native vegetation	Clearing of native vegetation	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Anthropogenic Climate Change	Human-caused Climate Change	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Loss of Hollow-bearing Trees	Loss of Hollow-bearing Trees	Threat > Habitat Loss/Change	Key Threatening Process	Predicted
Forest eucalypt dieback associated with over-abundant psyllids and Bell	Forest eucalypt dieback associated with over-abundant psyllids and	Threat > Other Threat	Key Threatening Process	Predicted

Scientific name	Common name	Type of species	NSW status	Occurrence
Miners	Bell Miners			
Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	Introduction of the large earth bumblebee (Bombus terrestris)	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by the Feral Cat Felis catus (Linnaeus, 1758)	Predation by feral cats	Threat > Pest Animal	Key Threatening Process	Predicted
Herbivory and environmental degradation caused by feral deer	Herbivory and environmental degradation caused by feral deer	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	Predation by the European Red Fox	Threat > Pest Animal	Key Threatening Process	Predicted
Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	Predation by the Plague Minnow (Gambusia holbrooki)	Threat > Pest Animal	Key Threatening Process	Predicted
Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	Predation, habitat degradation, competition and disease transmission by Feral Pigs (Sus scrofa)	Threat > Pest Animal	Key Threatening Process	Predicted
Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	Importation of red imported fire ants into NSW	Threat > Pest Animal	Key Threatening Process	Predicted
Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	Competition and grazing by the feral European rabbit	Threat > Pest Animal	Key Threatening Process	Predicted
Competition from feral honey bees, Apis mellifera L.	Competition from feral honeybees	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	Invasion of the yellow crazy ant (Anoplolepis gracilipes) into NSW	Threat > Pest Animal	Key Threatening Process	Predicted
Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion and establishment of the Cane Toad (Bufo marinus)	Invasion and establishment of the Cane Toad	Threat > Pest Animal	Key Threatening Process	Predicted
Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Threat > Pest Animal	Key Threatening Process	Predicted
Invasion and establishment of Scotch Broom (Cytisus scoparius)	Invasion and establishment of Scotch Broom (Cytisus scoparius)	Threat > Weed	Key Threatening Process	Predicted
Invasion of Native Plant Communities by African Olive Olea europaea L. subsp. cuspidata (Wall ex G.Don Ciferri)	Invasion of Native Plant Communities by African Olive Olea europaea L. subsp. cuspidata (Wall ex G.Don Ciferri)	Threat > Weed	Key Threatening Process	Predicted
Invasion of native plant communities by exotic perennial grasses	Invasion of native plant communities by exotic perennial grasses	Threat > Weed	Key Threatening Process	Predicted
Invasion of native plant communities by Chrysanthemoides monilifera	Invasion of native plant communities by bitou bush & boneseed	Threat > Weed	Key Threatening Process	Predicted
Invasion, establishment and	Invasion, establishment	Threat > Weed	Key	Predicted

Scientific name	Common name	Type of species	NSW status	Occurrence
spread of Lantana (Lantana camara L. sens. Lat)	and spread of Lantana (Lantana camara L. sens. lat)		Threatening Process	
Invasion and establishment of exotic vines and scramblers	Invasion and establishment of exotic vines and scramblers	Threat > Weed	Key Threatening Process	Predicted

DSEWPAC PROTECTED MATTERS SEARCH

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

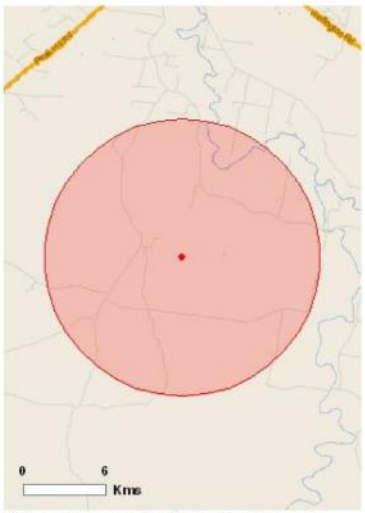
EPBC Act Protected Matters Report

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

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 06/02/13 09:30:07



Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	18
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

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

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Fish		
Maccullochella macquariensis		
Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni		
South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Bothriochloa biloba		
Lobed Blue-grass [3153]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta		
[4325]	Critically Endangered	Species or species habitat may occur within area
Rulingia procumbens		
[12903]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis		
[55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Xanthomyza phrygia		
Regent Honeyeater [430]	Endangered*	Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Coordinates

-32.45306 148.61106

Caveat

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

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

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

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

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

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

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

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

Acknowledgements

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

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

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

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

Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

NOXIOUS WEED DECLARATIONS FOR DUBBO CITY COUNCIL

The following weeds are declared noxious in the control area of Dubbo City Council:

Weed	Class	Legal requirements
African boxthorn [Lycium ferocissimum]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
African feathergrass [Pennisetum macrourum]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African turnipweed [Sisymbrium runcinatum]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African turnipweed [Sisymbrium thellungii]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Alligator weed [Alternanthera philoxeroides]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Anchored water hyacinth [Eichhornia azurea]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Annual ragweed [Ambrosia artemisiifolia]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Arrowhead [Sagittaria montevidensis]	4	The plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Artichoke thistle [Cynara cardunculus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Athel pine [Tamarix aphylla]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Bathurst/Noogoora/Hunter/South American/Californian/cockle burr [Xanthium species]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Bear-skin fescue [Festuca gautieri]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Black knapweed [Centaurea nigra]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Blackberry [Rubus fruticosus aggregate species] except cultivars Black satin Chehalem Chester Thornless Dirksen Thornless Loch Ness Murrindindi Silvan Smooth stem Thornfree	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Blue heliotrope [Heliotropium amplexicaule]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Boneseed [Chrysanthemoides monilifera	2	The plant must be eradicated from the land and the land

Weed	Class	Legal requirements
subspecies monilifera]		must be kept free of the plant
Bridal creeper [Asparagus asparagoides]	4	The plant must not be sold propagated or knowingly distributed
Broomrapes [Orobanche species] Includes all Orobanche species except the native O. cernua variety australiana and O. minor	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Burr ragweed [Ambrosia confertiflora]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cabomba [Cabomba species] Includes all Cabomba species except C. furcata	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cayenne snakeweed [Stachytarpheta cayennensis]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Chilean needle grass [Nassella neesiana]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed
Chinese violet [Asystasia gangetica subspecies micrantha]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Clockweed [Gaura parviflora]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Columbus grass [Sorghum x almum]	3	The plant must be fully and continuously suppressed and destroyed
Coolatai grass [Hyparrhenia hirta]	3	The plant must be fully and continuously suppressed and destroyed
Corn sowthistle [Sonchus arvensis]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Dodder [Cuscuta species] Includes All Cuscuta species except the native species C. australis, C. tasmanica and C. victoriana	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
East Indian hygrophila [Hygrophila polysperma]	4	The plant must not be sold propagated or knowingly distributed
Espartillo [Amelichloa brachychaeta, Amelichloa caudata]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Eurasian water milfoil [Myriophyllum spicatum]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Fine-bristled burr grass [Cenchrus brownii]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Fountain grass [Pennisetum setaceum]	5	The requirements in the Noxious Weeds Act 1993 for a

Weed	Class	Legal requirements
		notifiable weed must be complied with This is an All of NSW declaration
Gallon's curse [Cenchrus biflorus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Glaucous starthistle [Carthamus glaucus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Golden dodder [Cuscuta campestris]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Golden thistle [Scolymus hispanicus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Green cestrum [Cestrum parqui]	3	The plant must be fully and continuously suppressed and destroyed
Harrisia cactus [Harrisia species]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Hawkweed [Hieracium species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Heteranthera [Heteranthera reniformis]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Horsetail [Equisetum species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Hydrocotyl [Hydrocotyl ranunculoides]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Hygro [Hygrophila polysperma]		See East Indian hygrophila
Hymenachne [Hymenachne amplexicaulis and hybrids]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Johnson grass [Sorghum halepense]	3	The plant must be fully and continuously suppressed and destroyed
Karoo thorn [Acacia karroo]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Kochia [Bassia scoparia] except Bassia scoparia subspecies trichophylla	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Kosters curse [Clidemia hirta]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration

Weed	Class	Legal requirements
Lagarosiphon [Lagarosiphon major]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Lantana [Lantana species]	4	The plant must not be sold propagated or knowingly distributed
Leafy elodea [Egeria densa]	4	The plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Lippia [Phyla canescens]	4	The plant must not be sold propagated or knowingly distributed by any person other than a person involved in hay or lucerne production and the growth of the plant must be managed in a manner that reduces its spread and continuously inhibits its reproduction This is an All of NSW declaration
Long-leaf willow primrose [Ludwigia longifolia]	4	The plant must not be sold propagated or knowingly distributed
Mesquite [Prosopis species]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Mexican feather grass [Nassella tenuissima]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Mexican poppy [Argemone mexicana]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Miconia [Miconia species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Mikania [Mikania micrantha]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Mimosa [Mimosa pigra]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Mossman River grass [Cenchrus echinatus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Noogoora burr [Xanthium species]		See Bathurst/Noogoora/Hunter/South American/Californian/cockle burr
Pampas grass [Cortaderia species]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Parkinsonia [Parkinsonia aculeata]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Parthenium weed [Parthenium hysterophorus]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Pond apple [Annona glabra]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration

Weed	Class	Legal requirements
Prickly acacia [Acacia nilotica]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Prickly pear [Cylindropuntia species]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Prickly pear [Opuntia species] Includes all Opuntia species except O. ficus-indica	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Red rice [Oryza rufipogon]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Rhus tree [Toxicodendron succedaneum]	4	The growth of the plant must be managed in a manner that prevents any above ground part the plant from encroaching within 2m of the property boundary and the plant must not be sold propagated or knowingly distributed This is an All of NSW declaration
Rubbervine [Cryptostegia grandiflora]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Sagittaria [Sagittaria platyphylla]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Salvinia [Salvinia molesta]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Senegal tea plant [Gymnocoronis spilanthoides]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Serrated tussock [Nassella trichotoma]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed
Siam weed [Chromolaena odorata]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Silk forage sorghum [Sorghum species hybrid cultivar]	3	The plant must be fully and continuously suppressed and destroyed
Silverleaf nightshade [Solanum elaeagnifolium]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Smooth-stemmed turnip [Brassica barrelieri subspecies oxyrrhina]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Soldier thistle [Picnomon acarna]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

Weed	Class	Legal requirements
Spiny burrgrass [Cenchrus incertus]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed
Spiny burrgrass [Cenchrus longispinus]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed
Spotted knapweed [Centaurea stoebe subspecies micranthos]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
St. John's wort [Hypericum perforatum]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Sweet briar [Rosa rubiginosa]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Texas blueweed [Helianthus ciliaris]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Tree-of-heaven [Ailanthus altissima]	4	The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction
Tropical soda apple [Solanum viarum]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Water caltrop [Trapa species]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Water hyacinth [Eichhornia crassipes]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Water lettuce [Pistia stratiotes]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Water soldier [Stratiotes aloides]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Willows [Salix species] Includes all Salix species except S. babylonica, S. x reichardtii, S. x calodendron	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Witchweed [Striga species] Striga species except the native Striga parviflora	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Yellow burrhead [Limnocharis flava]	1	The plant must be eradicated from the land and the land must be kept free of the plant. This is an All of NSW declaration
Yellow nutgrass [Cyperus esculentus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

Key Threatening Processes listed by the OEH (TSC Act), DSEWPaC (EPBC Act) and DPI (FM Act).

KTP	Currently active in Project Area (identified on Wildlife Atlas)	Will KTP be exacerbated By the Proposal?
OEH KTP		
Alteration of habitat following subsidence due to longwall mining	No	No
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Yes	Yes.
Anthropogenic climate change	Yes	Yes. Mining activities will increase anthropogenic climate change. This will however be mitigated for by offset plantings and biodiversity rehabilitation.
Bushrock removal	Yes	Yes
Clearing of native vegetation	Yes	Yes
Competition and grazing by the feral European rabbit (Oryctolagus cuniculus)	Yes	No
Competition and habitat degradation by feral goats (Capra hircus)	Yes	Unlikely. KTP will probably be reduced as a result of feral animal management.
Competition from feral honey bees (Apis mellifera)	Yes	No
Death or injury to marine species following capture in shark control programs on ocean beaches	Yes	No
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	Yes	No
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	Yes	No
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Yes	No
Herbivory and environmental degradation caused by feral deer	Yes	No
Importation of red imported fire ants (Solenopsis invicta)	Yes	No
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	Yes	No
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Yes	No
Infection of native plants by Phytophthora cinnamomi	Yes	No
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	No	No
Introduction of the large earth bumblebee (Bombus terrestris)	No	No
Invasion and establishment of exotic vines and scramblers	No	No
Invasion and establishment of Scotch broom (Cytisus scoparius)	Yes	No
Invasion and establishment of the cane toad (Bufo	No	No

KTP	Currently active in Project Area (identified on Wildlife Atlas)	Will KTP be exacerbated By the Proposal?
OEH KTP		
marinus)		
Invasion of native plant communities by African Olive Olea europaea L. subsp. cuspidata	No	No
Invasion, establishment and spread of Lantana camara	No	No
Invasion of native plant communities by Chrysanthemoides monilifera (bitou bush and boneseed)	No	No
Invasion of native plant communities by exotic perennial grasses	Yes	Yes. This KTP however will be mitigated for by habitat rehabilitation
Invasion of the yellow crazy ant (Anoplolepis gracilipes (Fr. Smith)) into NSW	No	No
Loss of hollow-bearing trees	Yes	Yes
Loss or degradation (or both) of sites used for hill-topping by butterflies	No	No
Predation and hybridisation of feral dogs (Canis lupus familiaris)	Yes	Unlikely. KTP will be reduced as a result of feral animal management.
Predation by the European red fox (Vulpes vulpes)	Yes	Unlikely. KTP will be reduced as a result of feral animal management.
Predation by the feral cat (Felis catus)	Yes	No
Predation by Gambusia holbrooki Girard, 1859 (plague minnow or mosquito fish)	Yes	No
Predation by the ship rat (Rattus rattus) on Lord Howe Island	Yes	No
Predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa)	Yes	Unlikely. KTP will be reduced as a result of feral animal management.
Removal of dead wood and dead trees	Yes	Yes
FM Act KTP		
Current shark meshing program in NSW waters	No	No
Hook and line fishing in areas important for the survival of threatened fish species	No	No
Human-caused climate change	Unable to Determine	Yes. Mining activities will increase anthropogenic climate change. This will however be mitigated for by offset plantings and biodiversity rehabilitation.
The introduction of fish to fresh waters within a river catchment outside their natural range	Yes	No
The removal of large woody debris from NSW rivers and streams	Yes	No
The degradation of native riparian	Yes	Proposal will improve riparian habitat as a result of

KTP	Currently active in Project Area (identified on Wildlife Atlas)	Will KTP be exacerbated By the Proposal?
OEH KTP		
vegetation along New South Wales water courses		rehabilitation and biodiversity offsetting.
Instream structures and other mechanisms that alter natural flow	No	No
Introduction of non-indigenous fish and marine vegetation to the coastal waters of New South Wales	No	No
DSEWPaC KTP		
Competition and land degradation by rabbits	Yes	No
Competition and land degradation by unmanaged goats	Yes	No
Dieback caused by the root-rot fungus (Phytophthora cinnamomi)	No	No
Incidental catch (by catch) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South	No	No
Incidental catch (or by catch) of seabirds during oceanic longline fishing operations	No	No
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	Yes	No
Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris	No	No
Invasion of northern Australia by Gamba Grass and other introduced grasses	No	No
Land clearance	Yes	Yes
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.	No	No
Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (Anoplolepis gracilipes) on Christmas Island, Indian Ocean.	No	No
Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases	No	No
Predation by European red fox	Yes	No
Predation by exotic rats on Australian offshore islands of less than 1000 km2 (100,000 ha)	No	No
Predation by feral cats	Yes	No
Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs	Yes	Unlikely. KTP will probably be reduced as a result of feral animal management.
Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species	Yes	No
The biological effects, including lethal toxic ingestion, caused by Cane Toads (Bufo marinus).	No	No
The reduction in the biodiversity of Australian native fauna and flora due to the red imported fire ant, Solenopsis invicta (fire ant)	No	No

This page has been left intentionally blank

APPENDIX 3: HABITAT REQUIREMENTS OF LISTED SPECIES, POPULATIONS AND COMMUNITIES

This page has been intentionally left blank

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Australasian Bittern	*Botaurus poiciloptilus*	• Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleoacharis spp.). • Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. • Feeding platforms may be constructed over deeper water from reeds trampled by the bird. Platforms are often littered with prey remains. • Breeding occurs in summer from October to January. Nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. There are usually six olive-brown eggs to a clutch.	E	E	19	Known	Species or species habitat known to occur within area	Potential. Suitable permanent wetland habitat occurs in the form of farm dams and a large wetland on the *Mia Mia* property. Ephemeral wetlands suitable for this species would form during inundation of depressions on the Macquarie River floodplain. Agricultural activities around waterways including clearing, grazing and trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.
Barking Owl	*Ninox connivens*	• Nesting occurs during mid-winter and spring. Female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging starts 2 weeks later. Young are dependent for several months • Territorial pairs respond strongly to recordings of Barking Owl calls from up to 6km away, though humans rarely hear this response farther than 1.5km. Because disturbance reduces the pair's foraging time, and can pull the female off her eggs even on cold nights, recordings should not be broadcast unnecessarily or during the nesting season.	V		34	Known		Yes. Species is known to be associated with Wambangalang Creek and the Macquarie River in the Dubbo LGA. Breeding habitat exists in large hollow bearing trees associated with the waterways. Hunting habitat is likely to occur across the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Bilby	Macrotis lagotis	• Bilbies have been re-introduced to Scotia Reserve in New South Wales. • Bilbies can live in a range of habitats that include Mitchell grass plains, sandstone ridges, gibber plains, rocky soils with little ground cover, hummock and tussock grasslands, and Acacia shrublands.	Presumed Extinct	V	3			No
Black-breasted Buzzard	*Hamirostra melanosternon*	• Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. • Also hunts over grasslands and sparsely timbered woodlands. • Not a powerful hunter, despite its size, mostly taking reptiles, small mammals, birds, including nestlings, and carrion. • Also specialises in feeding on large eggs, including those of emus, which it cracks on a rock. • Breeds from August to October near water in a tall tree. The stick nest is large and flat and lined with green leaves. Normally two eggs are laid.	V		2	Known		Potential. Suitable hunting habitat for this species occurs in the Project Area. Breeding habitat could occur outside the Project Area in vegetation associated with the Macquarie River. Agricultural activities around waterways including clearing, grazing and trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	• Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*) and Forest Red Gum (*E. tereticornis*). • Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. • A gregarious species usually seen in pairs and small groups of up to 12 birds. • Feeding territories are large making the	V		4	Known		Likely. Suitable vegetation for this species occurs in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5ha • Breeds solitarily or co-operatively, with up to five or six adults, from June to December. • The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. • Two or three eggs are laid and both parents and occasionally helpers feed the young.						
Black-necked Stork	*Ephippiorhynchus asiaticus*	• Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation. • In NSW, Black-necked Storks breed in late spring and summer. Breeding activity has been recorded in most months, with activities from nest construction to fledging of young recorded from May to January. Most activity, however, takes place between June and December, and clutches present May to September. In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1m	E		5	Known		Potential. Suitable wetland habitat occurs in the form of farm dams and a large wetland on the *Mia Mia* property. Ephemeral wetlands suitable for this species would form during inundation of depressions on the Macquarie River floodplain. Agricultural activities around waterways including clearing, grazing and trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		to 2m in diameter, made in a live or dead tree, in or near a freshwater swamp. • The clutch-size of nests in NSW is not properly known, but nests have been observed with from one to three young in the nest. Broods of four young have been recorded in northern Queensland.						
Black-tailed Godwit	*Limosa limosa*	• Primarily a coastal species. • Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. • Further inland, it can also be found on mudflats and in water less than 10cm deep, around muddy lakes and swamps. • Individuals have been recorded in wet fields and sewerage treatment works. • Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. • Roosts and loafs on low banks of mud, sand and shell bars. • Frequently recorded in mixed flocks with Bar-tailed Godwits.	V		2	Known		Unlikely. Suitable mudflat / sandflat habitat does not occur in the Project Area.
Blue-billed Duck	*Oxyura australis*	• The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached. • Blue-billed Ducks will feed by day far from the shore, particularly if dense cover is available in the central parts of the wetland. They feed on the bottom of swamps eating seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies. • Blue-billed Ducks are partly migratory, with short-distance movements between	V		22	Known		Potential. Suitable wetland habitat occurs in the form of farm dams and a large wetland on the *Mia Mia* property. Ephemeral wetlands suitable for this species would form during inundation of depressions on the Macquarie River floodplain. Agricultural activities around waterways including clearing, grazing and

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		breeding swamps and overwintering lakes with some long-distance dispersal to breed during spring and early summer.						trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.
Bluegrass	*Dichanthium setosum*	• Associated with heavy basaltic black soils. • Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). It is open to question whether the species tolerates or is promoted by a certain amount of disturbance, or whether this is indicative of the threatening processes behind its depleted habitat. • Associated species include Eucalyptus albens, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus viminalis, Myoporum debile, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua, Medicago minima, Leptorhynchos squamatus, Lomandra aff. longifolia, Ajuga australis, Calotis hispidula and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia and Psoralea species. • Locally common or found as scattered clumps in populations. • Flowering time is mostly in summer.	V	V	2	Known		No. Black basaltic soils do not occur in the Project Area.
Booroolong Frog	Litoria booroolongensis	• Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. • Adults occur on or near cobble banks and other rock structures within stream margins.	E	E		Predicted		Unlikely. Suitable permanent streams with suitable rocky habitat does not occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Shelter under rocks or amongst vegetation near the ground on the stream edge. • •Sometimes bask in the sun on exposed rocks near flowing water during summer. • Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. • Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.						
Broad-headed Snake	Hoplocephalus bungariodes	• Nocturnal. • Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. • Moves from the sandstone rocks to shelters in hollows in large trees within 200m of escarpments in summer. • Feeds mostly on geckos and small skinks. Will also eat frogs and small mammals occasionally. • Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.	E	V		Predicted		Potential. Suitable rock crevices do occur in the Project Area, however the preferred habitat of exposed cliff edges with sandstone does not occur in the Project Area.
Brolga	*Grus rubicunda*	• Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. • They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs. • The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. Two eggs are laid from winter to autumn.	V		108	Known		Potential. Suitable wetland habitat occurs in the form of farm dams and a large wetland on the *Mia Mia* property. Ephemeral wetlands suitable for this species would form during inundation of depressions on the Macquarie River floodplain. Agricultural activities around waterways including clearing, grazing and

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
								trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	• Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Also found in Mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Usually not found in woodlands with a dense shrub layer. Fallen timber is an important habitat component for foraging. Also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. • Sedentary, considered to be resident in many locations throughout its range. Present in all seasons or year-round at many sites. Territorial year-round, though some birds may disperse locally after breeding. • Gregarious and usually observed in pairs or small groups of eight to 12 birds. Terrestrial and arboreal in about equal proportions. Active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber. Spend much more time foraging on the ground and fallen logs than other treecreepers.	V		110	Known		Yes.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• When foraging in trees and on the ground, they peck and probe for insects, mostly ants, amongst the litter, tussocks and fallen timber, and along trunks and lateral branches. Up to 80% of the diet is comprised of ants. Other invertebrates (including spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage. Nectar from Mugga Ironbark (*Eucalyptus sideroxylon*) and paperbarks, and sap from an unidentified eucalypt are also eaten, along with lizards and food scraps. Young birds are fed ants, insect larvae, moths, craneflies, spiders and butterfly and moth larvae. • Hollows in standing dead or live trees and tree stumps are essential for nesting. • The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring. Often in pairs or cooperatively breeding groups of two to five birds.						
Brush-tailed Phascogale	*Phascogale tapoatafa*	• Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. • Also inhabit heath, swamps, rainforest and wet sclerophyll forest. • Agile climber foraging preferentially in rough barked trees of 25cm DBH or greater. • Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. • Females have exclusive territories of approximately 20 - 60 ha, while males have	V			Known		Potential. Suitable habitat for this species occurs in the Project Area, particularly those areas with connectivity to Dowds hill.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		overlapping territories of up to 100 ha. • Nest and shelter in tree hollows with entrances 2.5cm to 4cm wide and use many different hollows over a short time span. • Mating occurs May - July. Males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.						
Brush-tailed Rock Wallaby	Petrogale penicillata	• Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. • Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. • Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night.	E	V		Predicted		No. Suitable rocky escarpments do not occur in the Project Area.
Bush Stone-curlew	*Burhinus grallarius*	• Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. • Largely nocturnal, being especially active on moonlit nights. • Feed on insects and small vertebrates, such as frogs, lizards and snakes. • Nest on the ground in a scrape or small bare patch. • Two eggs are laid in spring and early summer.	E		6	Known		Unlikely. Agricultural activities around waterways including clearing, grazing and trampling in addition to predatory noxious animals (foxes and cats), reduces the likelihood of this species occurring in the Project Area.
Cattle Egret	Ardea ibis	• The Cattle Egret is widespread and common according to migration movements and breeding localities surveys. Two major distributions have been located. From north-east Western Australia to the Top End of the Northern Territory and around south-east Australia. The Cattle Egret breeds in coastal areas.		Migratory > Listed			Species or species habitat may occur within area	Likely. Suitable habitat including grazing cattle occurs in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Coolibah-Black Box woodland of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions	Coolibah-Black Box woodland of the northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions	• Northern riverine plains in the Darling Riverine Plains and Brigalow Belt South bioregions	E Ecological Community	E		Known	Community likely to occur within area	No. Does not occur in the Project Area.
Diamond Firetail	*Stagonopleura guttata*	• Usually encountered in flocks of between five to 40 birds, occasionally more. • Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. • Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. • Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. • Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). • Groups separate into small colonies to breed, between August and January. • Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. • Birds roost in dense shrubs or in smaller nests built especially for roosting. • Appears to be sedentary, though some populations move locally, especially those in the south. • Has been recorded in some towns and near farm houses.	V		26	Known		Yes. Known to be associated with waterways.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Eastern Bent-wing Bat	Miniopterus schreibersii oceanensis	• Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. • Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. • Maternity caves have very specific temperature and humidity regimes. • At other times of the year, populations disperse within about 300km range of maternity caves. • Cold caves are used for hibernation in southern Australia. • Breeding or roosting colonies can number from 100 to 150,000 individuals. • Hunt in forested areas, catching moths and other flying insects above the tree tops.	V		14	Known		Yes.
Fork-tailed Swift	Apus pacificus	• The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia (Higgins 1999). In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999).		Migratory > Listed			Species or species habitat may occur within area	Potential to occur during migratory season.
Flame Robin	*Petroica phoenicea*	• Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. • Prefers clearings or areas with open understoreys. • The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. • Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands	V		1	Known		Yes.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		and sedgelands at high altitudes. • In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). • Often occurs in recently burnt areas. However, habitat becomes unsuitable as vegetation closes up following regeneration. • In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. • In winter, occasionally seen in heathland or other shrublands in coastal areas. • Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. • Flying insects are often taken in the air and sometimes gleans for invertebrates from foliage and bark. • In their autumn and winter habitats, birds often sally from fence-posts or thistles and other prominent perches in open habitats. • Occur singly, in pairs, or in flocks of up to 40 birds or more.in the non-breeding season they will join up with other insectivorous birds in mixed feeding flocks. • Breeds in spring to late summer. • Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. • Builds an open cup nest made of plant materials and spider webs. • Eggs are oval in shape and are pale bluish- or greenish-white and marked with brownish blotches. Clutch size is three or four eggs.						
Freckled Duck	*Stictonetta naevosa*	• Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi,	V		35	Known		Unlikely. Permanent freshwater swamps and creeks do not

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. • Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. • Nesting usually occurs between October and December but can take place at other times when conditions are favourable. • Nests are usually located in dense vegetation at or near water level.						occur in the Project Area.
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	• Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. • Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats. • Less than 5% of the original extent is estimated to remain. • Shrubs include Wilga, Deane's Wattle, Hop Bush, Cassia, Water Bush and Sifton Bush.	E Ecological Community			Predicted		Yes. Known to occur along Wambangalang Creek and on slight depression near Wambangalang Creek and the Macquarie River.
Gang-gang Cockatoo	Callocephalon fimbriatum	• In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. • May also occur in sub-alpine Snow Gum Eucalyptus pauciflora woodland and occasionally in temperate rainforests. • Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands,	V			Predicted		Unlikely. Suitable habitat for this species does not occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		particularly in box-ironbark assemblages, or in dry forest in coastal areas. • Favours old growth attributes for nesting and roosting.						
Gilbert's Whistler	*Pachycephala inornata*	• The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. • Though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understorey comprises dense patches of shrubs, particularly thickets of regrowth *Callitris* pine. Parasitic 'cherries' (*Exocarpus* species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised. • The Gilbert's Whistler forages on or near the ground in shrub thickets and in tops of small trees. Its food consists mainly of spiders and insects such as caterpillars, beetles and ants, and occasionally, seeds and fruits are eaten. • Breeding takes place between August and November. Nests are usually built below about two and a half meters (but up to six meters) above the ground in the fork of dense foliage of plants such as wattles or cypress pines. At Cowra three pairs nested in a 25 ha area. The nest is either a lined cup or sometimes birds use the old nests of other	V			Predicted		Unlikely. Suitable mallee habitat does not occur in the Project Area. However areas associated with Dowds hill may contain suitable shrubby mallee habitat.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		species, particularly disused babblers' nests. Two, three or occasionally four eggs are laid. • The movements of this species are poorly known but it is believed that generally it does not make any regular large-scale movements and pairs may hold and defend territories all year round. However, the occasional record outside the normal distribution may indicate some dispersal does occur, particularly given the difficulty in detecting this species outside the breeding season when it isn't calling.						
Great Egret, White Egret	Ardea alba	• Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. • The Great Egret usually feeds alone. It feeds on molluscs, amphibians, aquatic insects, small reptiles, crustaceans and occasionally other small animals, but fish make up the bulk of its diet. The Great Egret usually hunts in water, wading through the shallows, or standing motionless before stabbing at prey. Birds have also been seen taking prey while in flight.		Migratory > Listed			Species or species habitat may occur within area	Likely. Suitable habitat including grazing cattle occurs in the Project Area.
Glossy Black-cockatoo	*Calyptorhynchus lathami*	• Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. • In the Riverina area, again usually associated with woodlands containing Drooping She-oak but also recorded in open woodlands dominated by Belah (Casuarina cristata). • Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones	V	E (Only South-Australian Sub-species).	7	Known		Yes. Suitable feed trees also occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		with the massive bill. • Dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.						
Greater Long-eared Bat	*Nyctophilus timoriensis (South-eastern form)*	• The South-eastern Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. • The species also occurs in Bulloke woodland, Brigalow woodland, Belah woodland, Smooth-barked Apple, *Angophora leiocarpa,* woodland. River Red Gum, *Eucalyptus camaldulensis,* forests lining watercourses and lakes, Black Box, *Eucalyptus largiflorens,* woodland, dry sclerophyll forest.	V	V	1	Predicted	Species or species habitat may occur within area	Yes
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		• Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where average rainfall is 375- 800 mm pa and the mean maximum annual temperature is 22-26°C. • There is a correlation between the distribution of *Eucalyptus microcarpa* communities and soils of Tertiary and Quaternary alluvial origin, largely corresponding with the Red Brown Earths. • The majority of remnant patches of Inland Grey Box Woodland survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants.	E Ecological Community	E			Community may occur within area	Yes. Community known to occur in the Dubbo LGA Clearing is likely to have reduced the extent of community
Grey Falcon	*Falco hypoleucos*	• Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. • Also occurs near wetlands where surface	E			Known		Potential. Suitable habitat for this species exist in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		water attracts prey. • Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops, reptiles and mammals are also taken. • Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse, peak laying season is in late winter and early spring, two or three eggs are laid.						
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	• Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. • Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas. • Live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. All members of the family group remain close to each other when foraging. A soft 'chuck' call is made by all birds as a way of keeping in contact with other group members. • Feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses • Build and maintain several conspicuous, dome-shaped stick nests about the size of a football. A nest is used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones.	V		122	Known		Yes. Locally common in the Dubbo LGA within Box- White Cypress Pine dominated areas.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Breed between July and February. Usually two to three eggs are laid and incubated by the female. During incubation, the adult male and several helpers in the group may feed the female as she sits on the nest. Young birds are fed by all other members of the group. • Territories range from 1ha to 50ha (usually around 10ha) and are defended all year. Territorial disputes with neighbouring groups are frequent and may last up to several hours, with much calling, chasing and occasional fighting.						
White-bellied Sea-Eagle	Haliaeetus leucogaster	• The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The inland limits of the species are most restricted in south-central and south-western Australia, where it is confined to a narrow band along the coast (Barrett *et al.* 2003.Bilney & Emison 1983.Blakers *et al.* 1984.Marchant & Higgins 1993). Recent analysis indicates that the distribution of the sea-eagle may shift in response to climatic conditions, with an apparent decreased occupancy of inland sites (and increased occupancy of coastal sites) during drought conditions (Shephard *et al.* 2005a). • Breeding has been recorded from only a relatively small area of the total distribution. Breeding records are patchily distributed, mainly along the coastline, and especially the eastern coast, extending from Queensland to Victoria, and to Tasmania. Breeding has also been recorded at some sites further inland, e.g. around the Murray, Murrumbidgee and Lachlan Rivers in northern Victoria and south-west NSW, and at other large drainage		Listed			Species or species habitat likely to occur within area	Unlikely. Project Area, inland.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		systems and water storages (Marchant & Higgins 1993). Although known breeding sites are widely dispersed, the species could potentially breed throughout much of its range (Birds Australia 2006c, *pers. comm.*).						
White-throated Needletail	Hirundapus caudacutus	• The White-throated Needletail is widespread in eastern and south-eastern Australia (Barrett *et al.* 2003.Blakers *et al.* 1984.Higgins 1999). In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Divide, and there are few records in western Victoria outside the Grampians and the South West. The species occurs in adjacent areas of south-eastern South Australia, where it extends west to the Yorke Peninsula and the Mount Lofty Ranges. It is widespread in Tasmania (Barrett *et al.* 2003.Blakers *et al.* 1984.Higgins 1999). • White-throated Needletails only occur as vagrants in the Northern Territory (recorded in the Top End, including around Darwin, Katherine and Mataranka and Tennant Creek. further south around Alice Springs) and in Western Australia (at disparate sites from the Mitchell Plateau in the Kimberley, south to the Nullarbor Plain and Augusta in the South West, and west to Barrow Island, the Houman Abrolhos and the Swan River Plain) (Barrett *et al.* 2003.Blakers *et al.* 1984.Brooker *et al.* 1979.Sedgwick 1978.Slater 1964.Storr 1987.Storr *et al.* 1986.Wheeler 1959). The species is also a vagrant to various outlying islands, including Norfolk, Lord Howe, Macquarie, Christmas and Cocos-Keeling		Listed			Species or species habitat may occur within area	Potential.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		Islands (Barrand 2005.Green 1989.McAllan *et al.* 2004.Schodde *et al.* 1983.Stokes *et al.* 1984.Warham 1961a).						
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	• Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. • Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. • Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey. • Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. • May breed any time between July and November, often rearing several broods. • The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1m to 5m above the ground. • The nest is defended by both sexes with displays of injury-feigning, tumbling across the ground. • A clutch of two to three is laid and incubated for fourteen days by the female. Two females often cooperate in brooding.	V		35	Known		Yes. Known to occur in wooded and open grassland areas in the Project Area.
Koala	*Phascolarctos cinereus*	• Inhabit eucalypt woodlands and forests. • Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. • Inactive for most of the day, feeding and moving mostly at night. • Spend most of their time in trees, but will descend and traverse open ground to move	V		9	Known		Potential. Scats recorded in the Project Area in 2001 were identified as belonging to a Koala. Unlikely to occur within Mining Area due to distance between remnant trees and associated agricultural activity.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		between trees. • Home range size varies with quality of habitat, ranging from less than 2ha to several hundred hectares in size. • Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. • Females breed at two years of age and produce one young per year.						More likelihood to occur along riparian environments outside of the Mining Area.
Leafless Indigo	Indigofera efoliata	• Indigofera efoliata occurs in the central western slopes of NSW, from Dubbo to Geurie (Ayres *et al.*, 1996). In August 1955, the species was recorded along the Dubbo to Minore railway line and road, on Wallaringa and Geurie properties and in Goonoo State Forest (DECC, 2005). Forty eight sites were searched in November 1997, but no plants were found. • There are only two early records that contain precise locality details, both of which have been either heavily grazed or cleared of native vegetation, with one site now supporting a dense cover of weeds (Mackay & Gross, 1998). The species is very rare and considered to be possibly extinct (DECC, 2005). The species occurs within the Central West (NSW) Natural Resource Management Regions (DECC, 2005). • Indigofera efoliata prefers stony ground in red-brown sandy loam on a slight rise, among ironstone formation (Harden, 1991.Ayres *et al.*, 1996.Mackay & Gross, 1998). It appears to inhabit Yellow-box (Eucalyptus melliodora) woodland (Mackay & Gross, 1998), E. crebra–Callitris glaucophylla dry sclerophyll forest and E. macrocarpa–Callitris glaucophylla tall woodland (DECC, 2005). The average annual rainfall where the	E	E	14		Known	Unlikely. Due to rarity of species and lack of records, likely to be extinct. Suitable habitat exists in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		species has been recorded is between 475 and 600 mm (Mackay & Gross, 1998).						
Large-eared Pied Bat	*Chalinolobus dwyeri*	• Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	V	V			Species or species habitat may occur within area	Yes. Extensive cave and cliff areas do not occur in the Project Area. Small rock overhangs, which are unlikely roosting habitat occur on Dowds hill. More likely to have roosting cliff/cave habitat outside of the Project Area. Feeding / flying through the Project Area are known to occur.
Little Eagle	*Hieraaetus morphnoides*	• Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. • Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. • Lays two or three eggs during spring, and young fledge in early summer. • Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	V		21	Known		Yes. Hunting likely to occur in the Project Area. Breeding habitat likely to occur outside the Project Area in association with Wambangalang Creek and the Macquarie River.
Little Lorikeet	Glossopsitta pusilla	• Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards • Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. • Roosts in treetops, often distant from feeding areas. • Nests in proximity to feeding areas if possible,	V		1	Known		Yes. Potential to have breeding locations in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3cm) and usually high above the ground (2m to15m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Allocasuarina. • Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. However, the survival rate of fledglings is unknown. • Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. • Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.						
Little Pied Bat	*Chalinolobus picatus*	• Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, Bimbil box. • Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. • Can tolerate high temperatures and dryness but need access to nearby open water. • Feeds on moths and possibly other flying invertebrates.	V		25	Known		Yes. Habitat suitable for this species occurs in the Project Area.
Little Whip Snake	Suta flagellum	• Occurs in Natural Temperate Grasslands and grassy woodlands, including those dominated by Snow Gum Eucalyptus pauciflora or Yellow Box E. melliodora. • Also occurs in secondary grasslands derived from clearing of woodlands. • Found on well drained hillsides, mostly	V			Predicted		Potential. Habitat suitable for this species occurs in the Project Area in both derived grasslands and rocky areas associated with

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		associated with scattered loose rocks. • Most specimens have been found under rocks or logs lying on, or partially embedded in the soil. • Little is known about the habits of this small snake as it is primarily nocturnal. • Feeds on lizards and frogs. • Up to seven live young are born between September and February.						Trachyte hills.
Lobed Blue-grass [3153]	Bothriochloa biloba	• Lobed Blue-grass is known from the Darling Downs district in Queensland, south along the western slopes of the Great Dividing Range to North Star, Warialda, Bingara and Merriwa in NSW (Quinn *et al.*, 1995.NSW Scientific Committee, 2004). It also occurs west to Dubbo and around the Hunter Valley (Quinn *et al.*, 1995). • This species occurs within the Hunter–Central Rivers, Central West, Namoi, Northern Rivers and Border Rivers–Gwydir (NSW) and Border Rivers Maranoa–Balonne and Condamine (Queensland) Natural Resource Management Regions. • Lobed Blue-grass grows in cleared eucalypt forests and relict grassland, often dominated by Purple Wiregrass (Aristida ramosa), Red-leg Grass (Bothriochloa macra), Red Grass (B. decipiens), Queensland Bluegrass (Dichanthium sericeum) or Austrostipa aristiglumis (Bean, 1999). Dense stands of Lobed Blue-grass have been recorded in Windmill Grass (Chloris truncata) Grassland in the north-western slopes of NSW (Hunter, 2003). • Lobed Blue-grass prefers heavier-textured soils such as brown or black clay soils (Quinn *et al.*, 1995.Bean, 1999).		V		Not listed	Species or species habitat likely to occur within area	Potential. Suitable soils for this species exist in the Project Area. It is likely that agricultural activity in the Project Area has reduced its likelihood of occurrence.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Magpie Goose	*Anseranas semipalmata*	• Mainly found in shallow wetlands (less than 1m deep) with dense growth of rushes or sedges. • Equally at home in aquatic or terrestrial habitats. Often seen walking and grazing on land. Feeds on grasses, bulbs and rhizomes. • Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off. Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level. Most breeding now occurs in monsoonal areas. Nests are formed in trees over deep water. Breeding is unlikely in south-eastern NSW. • Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains. Roosts in tall vegetation.	V		42	Known		Likely. Shallow wetlands occur in the Project Area particularly on the Macquarie River floodplain and ephemeral wetlands on the Mia Mia property.
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	• Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. • Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. • Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. • Nesting, in tree hollows, occurs throughout the second half of the year. Nests are at least 1 kilometre apart, with no more than one pair every 30 square kilometres.	V		9	Known		Potential. Not regularly recorded in the Dubbo LGA. Habitat suitable for this species exists in the Project Area.
Malleefowl	*Leipoa ocellata*	• Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub	E	E	1	Predicted		Unlikely. Dense mallee dominated communities do not occur in the Mining Area. Thick mallee like areas do however

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		understorey. • Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. • Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers. • Although Malleefowl will occupy areas within five years of fire, they prefer older age classes, with little breeding in areas less than 20 years after fire, and in one study the highest densities recorded in long unburnt mallee (60 to 80 years post fire). • A pair may occupy a range of between 50 and 500 ha, overlapping with those of their neighbours. Mainly forage in open areas on seeds of acacias and other native shrubs (*Cassia, Beyeria, Bossiaea*), buds, flowers and fruits of herbs and various shrubs, insects (cockroaches, ants, soil invertebrates), and cereals if available. • Incubate eggs in large mounds that contain considerable volumes of sandy soil. The litter within the mounds must be dampened for it to decompose and provide heat for incubation of eggs. Up to 34 eggs may be laid in a single season, though usually between 15 and 24 (and clutches smaller in dry years). The male monitors the temperature within the egg chamber using its bill, and regularly works the mound during the breeding season to maintain a constant temperature around 34 degrees. The chicks hatch after between 49 and 96 days (average around 60) and can walk as soon as they emerge from the						occur on Dowds Hill which may provide suitable habitat. Agricultural activities and predatory feral animals are likely to have reduced its possibility of occurrence to nil.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		mound, can run quickly within two hours and can fly within 24 hours.						
Masked Owl	*Tyto novaehollandiae*	• Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. • Lives in dry eucalypt forests and woodlands from sea level to 1100 m. • A forest owl, but often hunts along the edges of forests, including roadsides. • The typical diet consists of tree-dwelling and ground mammals, especially rats. • Pairs have a large home-range of 500ha to 1000ha.	V			Known		Potential. Large hollow bearing trees are in abundance within and adjacent to the Project Area. Not as common in the Dubbo LGA as the Barking Owl.
Merops ornatus	Rainbow Bee-eater	• The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). • It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (Badman 1979.Boekel 1976.Fry 1984.Roberts 1979.Storr 1984a, 1984b, 1985a). It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches (Higgins 1999). The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands (Gibson 1986.Jones 1986.Leach 1988.Longmore 1978.McEvey & Middleton 1968.Saunders & Ingram 1995.Woinarski *et al.* 1988, 1989) and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (Badman		Migratory JAMBA	Recorded at Macquarie River in Dubbo (pers. Obs)		Species or species habitat may occur within area	Yes. Known to occur in the Dubbo LGA during breeding season. This species is highly likely to utilise deep sandy banks associated with the Macquarie River and potentially Wambangalang Creek for breeding tunnels. Breeding habitat does not occur in the Project Area, however may occur at the proposed areas of culvert/bridge upgrade and the intake point of the proposed Water Pipeline.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		1989.Gee *et al.* 1996.Gibson 1986.Gibson & Cole 1988.Henle 1989.Longmore 1978.Storr 1977.Woinarski *et al.* 1988).						
Murray Cod, Cod, Goodoo	Maccullochella peelii peelii	• The Murray Cod is the largest freshwater fish found in Australia. It is a long lived predator species that is highly territorial and aggressive. It occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat.	FM Act	V			Species or species habitat may occur within area	Potential. Known to occur in the Macquarie River and as such may have habitat at the proposed water intake point.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland		• Native tussock grasslands, such as the Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland, once occurred over a large area of Australia (DEWR 2007). The species composition of tussock grasslands varies throughout its range and is influenced by factors such as rainfall, soil, geology and land use history. These influences may vary the expression of the ecological community over short periods or across small distances (Butler 2007 unpublished).		C E			Community may occur within area	Potential.
Northern Bettong	Bettongia tropica	• Historically, the Northern Bettong occurred in Queensland, from Rockhampton to the present northern distribution near Cairns (Laurance 1997.Wakefield 1967). It occurred on Mt Windsor, Mt Carbine, the Lamb Range, near Rockhampton, near Ravenshoe (Johnson & McIlwee 1997), in the Paluma Range (Pope *et al.* 2000) and two individuals were found on a property at Mt Zero, north-west of Townsville (Herald Sun 2002). The Northern Bettong currently occurs in three geographically isolated locations: the Lamb Range, Paluma and Mt Zero, Queensland. Mt	Presumed Extinct	E	1			No.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		Windsor Tableland was known to have an existing population as recently as January 1989. However, despite considerable effort (520 trap nights.44 hours of spotlighting, Winter 1992), no Northern Bettongs have been seen since this time. • Northern Bettong distribution appears to be limited by the availability of hypogenous fungi (truffles) and potentially, cockatoo grass, *Alloteropsis semialata*, and lilies, *Hypoxix spp*., all of which are critical food resources (Johnson & McIlwee 1997). The distribution of these resources appears to be limited by vegetation associations with fire. Areas that remain unburnt in the tall, wet sclerophyll forest component of Northern Bettong habitat soon lose some or all of these resources (Dennis 2001). • The Northern Bettong occurs in three (possibly four) disjunct locations. They have disappeared completely from two of their previous known locations, Dawson Valley and greater Ravenshoe area (Dennis 2001).						
Osprey	Pandion haliaetus	• Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. • Feed on fish over clear, open water. • Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometres of the sea.	V		1			Unlikely.
Painted Honeyeater	*Grantiella picta*	• Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. • A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. • Insects and nectar from mistletoe or eucalypts are occasionally eaten. • Nest from spring to autumn in a small, delicate nest hanging within the outer canopy	V		10	Known		Likely. Suitable habitat for this species exists in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		of drooping eucalypts, she-oak, paperbark or mistletoe branches.						
Painted Snipe	Rostratula australis	• Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. • Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. • The nest consists of a scrape in the ground, lined with grasses and leaves. • Breeding is often in response to local conditions. Generally occurs from September to December. • Forages nocturnally on mud-flats and in shallow water. • Feeds on worms, molluscs, insects and some plant-matter.	V	V			Species or species habitat may occur within area	Potential. Suitable habitat occurs in the Project Area in the form of farm dams and ephemeral and permanent wetlands, particularly on the Mia Mia property.
Painted Snipe (Australian subspecies)	*Rostratula benghalensis australis*	• Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. • Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. • The nest consists of a scrape in the ground, lined with grasses and leaves. • Breeding is often in response to local conditions. Generally occurs from September to December. • Forages nocturnally on mud-flats and in shallow water. • Feeds on worms, molluscs, insects and some plant-matter.	E	V Migratory CAMBA	5	Known	Species or species habitat may occur within area	Potential. Suitable habitat occurs in the Project Area in the form of farm dams and ephemeral and permanent wetlands, particularly on the Mia Mia property.
Pale-headed Snake	*Hoplocephalus bitorquatus*	• Found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. • Favours streamside areas, particularly in drier habitats. • Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs	V			Predicted		Potential. Suitable habitat for this species exists in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		of dead trees. • The main prey is tree frogs although lizards and small mammals are also taken.						
Pine Donkey Orchid	*Diuris tricolor*	• The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris spp.*). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. • Usually recorded as common and locally frequent in populations, however only one or two plants have also been observed at sites. The species has been noted as growing in large colonies. • Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. • Associated species include *Callitris glaucophylla, Eucalyptus populnea, Eucalyptus intertexta*, Ironbark and *Acacia* shrubland. The understorey is often grassy with herbaceous plants such as *Bulbine* species. • Flowers from September to November or generally spring. The species is a tuberous, deciduous terrestrial orchid and the flowers have a pleasant, light sweet scent.	V		2	Known		Likely. Known to occur in the Dubbo LGA within several types of communities, particularly associated with Cypress Pine and drainage lines.
Pink-tailed Worm-lizard	Aprasia parapulchella	• Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (Themeda australis). • Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. • Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks. The burrows have been constructed by and are often still inhabited by small black ants and termites.	V	V		Not identified in Central West Sub CMAs Pilliga, Bogan Macquarie or Talbragar Valley		Yes. Known to occur on Dowds hill and the proposed Open Cut. Suitable habitat exists for this species on trachyte hills where associated soils, loose rock, grasses and ant species occur.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Feeds on the larvae and eggs of the ants with which it shares its burrows. • It is thought that this species lays two eggs inside the ant nests during summer. The young first appear in March.						
Powerful Owl	Ninox Strenua	• The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. • The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species. • The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Birds comprise about 10% of the diet, with flying foxes important in some areas. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. • Pairs of Powerful Owls are believed to have	V			Predicted		Potential. Large hollow bearing trees occur in the Project Area. This species is less likely to occur in the Project Area than the barking Owl.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha. • Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80cm to 240cm) that are at least 150 years old. During the breeding season, the male Powerful Owl roosts in a "grove" of up to 20-30 trees, situated within 100m to 200m of the nest tree where the female shelters. • Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.						
Eastern pygmy possum	Cercartetus nanus	• Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. • Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes.an important pollinator of heathland plants such as banksias. Soft fruits are eaten when flowers are unavailable. • Also feeds on insects throughout the year. This feed source may be more important in habitats where flowers are less abundant such as wet forests. • Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrines) dreys or thickets of vegetation, (e.g.. grass-tree skirts).nest-building appears to be restricted to breeding females. Tree hollows are	V			Predicted		Potential. Suitable habitat for this species occurs on Dowds hill and connected remnants

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. • Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68ha and females about 0.35ha. • Young can be born whenever food sources are available, however most births occur between late spring and early autumn. • Agile climbers, but can be caught on the ground in traps, pitfalls or postholes. Generally nocturnal. • Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.						
Red Darling Pea	*Swainsona plagiotropis*	• Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. Soils are derived from quaternary sediments and are usually red-brown clay-loams. The species is absent from black low-lying soils. • Recorded from roadsides, rail reserves, stock routes and areas of lightly grazed unimproved pasture comprising *Austrodanthonia, Enteropogon acicularis* and *Austrostipa* grassland communities. • Associated species include Austrostipa aristiglumis, A. nodosa, A. setacea, Homopholis proluta, Chloris truncata, Austrodanthonia caespitosa, A. duttoniana, Enteropogon acicularis, Hordeum spp., Lolium rigidum, Rhodanthe corymbiflora, Calotis scabiosifolia, Microseris lanceolata and Chrysocephalum apiculatum. • *Swainsona plagiotropis* appears to be an indicator species	V	V	4	Known		No. Suitable soils for this species do not occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		of *Enteropogon* and *Austrostipa* grasslands, communities which are poorly known and almost extinct. Other significant plants found in these grassland communities include *Sclerolaena napiformis, Swainsona murrayana, S. sericea, Brachyscome chrysoglossa, Leptorhynchos panaetioides* and *Maireana excavata*. • Flowering is from August to November, with fruit maturing in November. The species is a perennial, but the lifespan is unknown. • Some form of disturbance (for example, light grazing at appropriate times, occasional soil disturbance or periodic fire) appears to be necessary to reduce competition and enhance seedling growth of *Swainsona plagiotropis* within grassy swards. • As with most other hard-seeded pea species, it is likely to require fire, prolonged wet conditions or soil disturbance to break the water-impermeable testa of the seed and allow germination. The large numbers present at Jerilderie 18 months after a fire and after two successive wet seasons support this hypothesis. Light grazing also reduces grass cover, maintaining an open sward and allowing sufficient inter-tussock space for germination and establishment.						
Regent Honeyeater	*Anthochaera phrygia*	• The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly	C E	E			Species or species habitat may occur within area	Potential. Non-breeding habitat may occur in the Project Area. Breeding habitat for this species does not occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		large numbers of mature trees, high canopy cover and abundance of mistletoes. • Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago. • The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, Corymbia maculata,* E.mckieana, E. macrorhyncha, E. laevopinea, and Angophora floribunda. Nectar and fruit from the mistletoes A. miquelii, A. pendula, A. cambagei are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material.						
Scarlet Robin	*Petroica boodang*	• The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. • This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in	V			Known		Potential. The Project Area is known to have suitable threatened robin habitat.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		wetlands and tea-tree swamps. • Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. • The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions. This species is occasionally found up to 1000 meters in altitude. • The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. • In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. • The Scarlet Robin is a quiet and unobtrusive species which is often quite tame and easily approached. • Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs, they sometimes forage in the shrub or canopy layer. • Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January, they may raise two or three broods in each season. • This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 meters above the ground, nests are often found in a dead branch in a live tree, or in a dead tree or shrub. • Eggs are pale greenish-, bluish- or brownish-white, spotted with brown, clutch size ranges from one to four.						

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Birds usually occur singly or in pairs, occasionally in small family parties, pairs stay together year-round. • In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.						
Sloane's Froglet	*Crinia sloanei*	• It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.	V		2	Known		Potential. Suitable periodically inundated areas in grassland, woodland occurs on the western and northern edges of the Project Area.
Small Purple-pea	*Swainsona recta*	• Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*. • Grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, Poa tussocks *Poa* spp. and spear-grasses *Austrostipa* spp. • Plants die back in summer, surviving as a rootstocks until they shoot again in autumn. • Flowers throughout spring, with a peak in October. • Seeds ripen at the end of the year. • Individual plants have been known to live for up to 20 years. • Generally tolerant of fire, which also enhances germination by breaking the seed coat and reduces competition from other species.	E	E	1	Known		Potential. Suitable habitat for this species may occur in the Project Area.
Speckled Warbler	Chthonicola sagittata	• The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky	V		1	Known		Yes. Known to occur.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		ridges or in gullies. • Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. • Large, relatively undisturbed remnants are required for the species to persist in an area. • The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. • Pairs are sedentary and occupy a breeding territory of about 10ha, with a slightly larger home-range when not breeding. • The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. • A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. The eggs are a glossy red-brown, giving rise to the unusual folk names 'Blood Tit' and 'Chocolatebird'. • Some cooperative breeding occurs. The species may act as host to the Black-eared Cuckoo. • Speckled Warblers often join mixed species feeding flocks in winter, with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbill.						
Spotted Harrier	*Circus assimilis*	• Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, and grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. • Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young	V		19	Known		Yes. Known to occur.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		remaining in the nest for several months. • Preys on terrestrial mammals (egg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.						
Spotted-tailed Quoll	*Dasyurus maculatus*	• Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces, these may be visited by a number of individuals, latrine sites can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. • Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. • Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. • Mostly nocturnal, although will hunt during the day, spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds. • Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects, also eats carrion and takes domestic fowl. • Females occupy home ranges up to about 750ha and males up to 3,500ha.usually traverse their ranges along densely vegetated creek lines. • Average litter size is five, both sexes mature at about one year of age.	V	E	2	Known	Species or species habitat may occur within area	Potential. Suitable habitat exists in the Project Area including hollow bearing trees and dead and down timber. More likely to have core habitat within Dowds hill than the open cleared areas dominating the Project Area .
Square-tailed Kite	*Lophoictinia isura*	• Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. • In arid north-western NSW, has been	V		2	Known		Yes. Known to occur in the locality.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. • Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage? • Appears to occupy large hunting ranges of more than 100kilometer2. • Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.						
Squirrel Glider	*Petaurus norfolcensis*	• Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. • Prefers mixed species stands with a shrub or Acacia midstorey. • Live in family groups of a single adult male one or more adult females and offspring. • Require abundant tree hollows for refuge and nest sites. • Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	V			Predicted		Unlikely. Most mature areas of Box-Gum woodland have been cleared and/or disturbed in the Project Area and now exist as open woodland or isolated trees. Potential to occur outside the Project Area in mature riparian vegetation associated with Wambangalang Creek and the Macquarie River.
Stripe-faced Dunnart	*Sminthopsis macroura*	• Native dry grasslands and low dry shrublands, often along drainage lines. During periods of hot weather they shelter in cracks in the soil, in grass tussocks or under rocks and logs.	V			Known		Potential.
Superb Parrot	*Polytelis swainsonii*	• Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. • In the Riverina the birds nest in the hollows of	V	V	45	Known	Species or species habitat likely to	Known. The Superb Parrot is known to frequent Box-Gum Woodland in the

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. • Nest in small colonies, often with more than one nest in a single tree. • Breed between September and January. • May forage up to 10km from nesting sites, primarily in grassy box woodland. • Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.					occur within area	Dubbo LGA during the non-breeding season. This species does not breed in the Dubbo LGA.
Swift Parrot	*Lathamus discolor*	• Migrates to the Australian south-east mainland between March and October. • On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. • Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. • Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. mollucana* and Blackbutt *E. pilularis*. • Return to some foraging sites on a cyclic basis depending on food availability. • Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*.	E	E			Species or species habitat likely to occur within area	Known. Previously recorded in the Project Area. Breeding habitat for this species occurs in Tasmania.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Trout Cod	Maccullochella macquariensis	• This species is restricted to the cooler upper reaches, but not near or at the source, of the Murray R. (Lake 1971). In 1971, Lake noted that it was extremely rare upstream of Yarrawonga, where it was common 20 years before. Today, the only naturally occurring population is restricted to a small (approx. 120 kilometre) stretch of the Murray R. from below Yarrawonga Weir to Strathmerton (Rimmer 1987.Douglas *et al.* 1994.NSW Fisheries 2001), but is occasionally taken downstream as far as the Barmah SF (McKinnon 1993). • Trout Cod were translocated from the Goulburn R. to Seven Creeks (Vic.) in 1921-22 (Cadwallader & Backhouse 1983). The Seven Creeks population occurs upstream of Euroa between Gooram Falls and Polly McQuinns Weir (Reed 1995), a distance of about 8 kilometre (Douglas *et al.* 1994). Trout Cod from the Ovens R. were introduced into L. Sambell (an artificial lake at Beechworth, Vic.) in 1928 and the species was common here until an unexplained fish kill in the 1970s (Berra & Weatherley 1972.Cadwallader & Backhouse 1983). • Trout Cod was introduced into Cataract Dam (Nepean R., NSW) before 1915 (Rimmer 1988.Douglas *et al.* 1994). • Trout Cod have been hatchery-bred and reared since 1986 in NSW (Rimmer 1987) and Vic., and over 200 000 fingerlings and yearlings had been released into sites within its former distribution in the Murray-Darling R. system of Vic., NSW and the ACT by 1996 (Harris & Rowland 1996). By the year 2000, the number of stocked individuals had increased to over 750,000 (NSW Fisheries 2001). Stocking sites include the Murray,	FM Act	E			Species or species habitat may occur within area	Yes, Known to occur in the Macquarie River. Potential habitat for this species may exist at the proposed Water Pipeline intake point.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		Murrumbidgee, Macquarie and Abercrombie R. catchments in NSW. The Goulburn, Ovens, Broken, Coliban and Mitta Mitta R. catchments in Vic.. the Murrumbidgee R. catchment in the ACT (Faragher *et al.* 1993.Douglas *et al.* 1994.Brown *et al.* 1998.ACT Govt 1999a). • Few records exist of trout cod surviving past three years of age at any of the re-introduction sites except in the case of Ryans Ck (Vic.) where a sizeable adult population, which has since disappeared, became established in Loombah Weir (Brown *et al.* 1998). The failure to capture individuals older than three years of age at re-introduction sites may be due to a failure of the sampling method, migration or due to the elimination of fish by recreational fishers (Brown *et al.*1998). Evidence of natural recruitment from a stocked population has been obtained from the capture of two individuals in the Murrumbidgee R. that did not show the chemical mark carried by stocked fingerlings (Brown *et al.* 1998).						
Turquoise Parrot	*Neophema pulchella*	• Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. • Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. • Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. • Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed.	V		4	Known		Likely. Breeding habitat for this species is more likely to occur on the western edge of the Mining Area associated with Wambangalang Creek. However agricultural activities such as timber gathering are likely to have removed much suitable habitat.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.						
Varied Sittella	Daphoenositta chrysoptera	• Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. • Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. • Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. • Generation length is estimated to be 5 years.	V		9			Potential. Suitable habitat for this species exists in the Project Area.
Western Barred Bandicoot (mainland)	Perameles bougainville fasciata	• The Western Barred Bandicoot (mainland) formerly occurred over much of southern Australia in arid and semi-arid areas. Gould (1863) recorded the species in the south-west of Western Australia. It was once common in the Perth district, in the wheat-belt and north to Shark Bay. The last specimen recorded in Western Australia was at Onslow in 1909. In NSW, the species was reported to have inhabited the Liverpool Plains and western areas through to the Murray Darling Basin. Krefft (1866) reported its existence as far east as the Sydney district. The last specimen was taken from the Liverpool Plains in 1841 and the Murray-Darling River junction in 1857. The species was known from north-western Victoria, in the Murray Valley region. In South Australia, the species occurred along the Murray River, near Adelaide, at the head of St Vincent's Gulf, and in the far west. The last specimen from anywhere on the mainland	Presumed Extinct	Extinct	1			No.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		was taken at Ooldea, South Australia, in 1922 (Flannery 1990f). • The Western Barred Bandicoot (mainland) formerly inhabited a variety of landscapes and vegetation types. • These included the saltbush covered Nullarbor Plain, sand ridges with woodlands, bluebush plains, desert *Acacia*, shrublands and heath (Flannery 1990). Gould reported that they preferred dense scrub such as *Allocasuarina* thickets (Gould 1863). • The well camouflaged nest was reportedly constructed from grasses and other vegetation in a hollow dug under a low shrub (Gould 1863). • The Western Barred Bandicoot (mainland) appeared to be omnivorous, eating insects, seeds, roots, herbs and small animals (Flannery 1990f). Krefft commented that it was a proficient mouse catcher (Krefft 1866).						
Weeping Myall		• Typically, the ecological community occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. The structure of the community varies from low woodland and low open woodland to low sparse woodland or open shrubland, depending on site quality and disturbance history. The tree layer grows up to a height of about 10 metres and invariably includes Acacia pendula (Weeping Myall or Boree) as one of the dominant species or the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs.	EEC	E			Community may occur within area	Unlikely.
White Box-Yellow Box-		• Characterised by the presence or prior occurrence of White Box, Yellow Box and/or	EEC	C E			Community may occur	Yes. Known to occur on undulating ground

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
Blakely's Red Gum Grassy Woodland and Derived Native Grassland		Blakely's Red Gum. • The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. • Commonly co-occurring eucalypts include Apple Box (*E. bridgsiana*), Red Box (*E. polyanthemos*), Candlebark (*E. rubida*), Snow Gum (*E. pauciflora*), Argyle Apple (*E. cinerea*), Brittle Gum (*E. mannifera*), Red Stringybark (*E. macrorhyncha*), Grey Box (*E. microcarpa*), Cabbage Gum (*E. amplifolia*) and others. • The understorey in intact sites is characterised by native grasses and a high diversity of herbs. The most commonly encountered include Kangaroo Grass (*Themeda australis*) Poa Tussock (*Poa sieberiana*), wallaby grasses (*Austrodanthonia spp.*), spear-grasses (*Austrostipa spp.*), Common Everlasting (*Chrysocephalum apiculatum*), Scrambled Eggs (*Goodenia pinnatifida*), Small St John's Wort (*Hypericum gramineum*), Narrow-leafed New Holland Daisy (*Vittadinia muelleri*) and blue-bells (*Wahlenbergia spp.*). • Shrubs are generally sparse or absent, though they may be locally common. • Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant. • Sites with particular characteristics, including varying age classes in the trees, patches of regrowth, old trees with hollows and fallen timber on the ground are very important as wildlife habitat. • Sites in the lowest parts of the landscape often support very large trees which have leafy crowns and reliable nectar flows - sites important for insectivorous and nectar feeding					within area	in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		birds. • Sites that retain only a grassy groundlayer and with few or no trees remaining are important for rehabilitation, and to rebuild connections between sites of better quality. • Remnants support many species of threatened fauna and flora. • Retention of remnants is important as they contribute to productive farming systems (stock shelter, seed sources, sustainable grazing and water-table and salinity control). • The fauna of remnants (insectivorous birds, bats, etc.) can contribute to insect control on grazing properties. • Some of the component species (e.g. wattles, she-oaks, native legumes) fix nitrogen that is made available to other species in the community, while fallen timber and leaves recycle their nutrients. • Disturbed remnants are considered to form part of the community, including where the vegetation would respond to assisted natural regeneration.						
White-footed Tree-rat	Conilurus albipes	• The White-footed Rabbit-rat was known to inhabit open forest woodlands and grassy ecosystems in Victoria (Seebeck & Menkhorst 2000). Habitat information is not known for other states in which the species occurred. • Gould observed the species sleeping in the hollow limbs of prostrate trees, or in hollow branches of large *Eucalypts* near the ground (Gould 1863).	Presumed Extinct	Extinct	2			No.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
White-fronted Chat	Epthianura albifrons	• Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals. • Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals. • The Newington and Towra Point populations are thought to be disjunct from each other (and from the nearest populations outside Sydney Metropolitan CMA). • Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. • Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23cm above the ground (but have been found up to 2.5m above the ground). • Two to three eggs are laid in each clutch, and the complete nesting cycle from nest-building to independent young is approximately 50 days. • Birds can breed at one year of age and are estimated to live for five years.	EP		15	Known		Potential. Suitable habitat occurs in the Project Area for this species.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	• Roosts singly or in groups of up to six, in tree hollows and buildings.in treeless areas they are known to utilise mammal burrows. • When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	V		16	Known		Yes. Known to occur,

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Forages in most habitats across its very wide range, with and without trees. Appears to defend an aerial territory. • Breeding has been recorded from December to mid-March, when a single young is born. • Seasonal movements are unknown. There is speculation about a migration to southern Australia in late summer and autumn.						
	Rulingia procumbens	• Grows in sandy sites, often along roadsides. • Recorded in *Eucalyptus dealbata* and *Eucalyptus sideroxylon* communities, *Melaleuca uncinata* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey, and in a recently burnt Ironbark and *Callitris* area. Also in *Eucalyptus fibrosa* subsp. *nubila, Eucalyptus dealbata, Eucalyptus albens* and *Callitris glaucophylla* woodlands north of Dubbo. • Other associated species include Acacia triptera, Callitris endlicheri, Eucalyptus melliodora, Allocasuarina diminuta, Philotheca salsolifolia, Xanthorrhoea species, Exocarpus cupressiformis, Leptospermum parvifolium and Kunzea parvifolia. • Fruiting period is summer to autumn. Flowers from August to December. • Appears to produce seed which persists for some time in the seed bank. Large numbers of seedlings have been observed germinating after fire at sites where the species was not apparent above ground before the fires. Clusters of individuals may be clonal. • The species is often found as a pioneer species of disturbed habitats. It has been recorded colonising disturbed areas such as roadsides, the edges of quarries and gravel stockpiles and a recently cleared easement	V	V	Yes. Recorded within 5km	Known	Species or species habitat likely to occur within area	Potential habitat for this species occurs on Dowds Hill in associated with Acacia triptera. Habitat suitable for this species does not occur in the Mining Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		under power lines. • Has been recorded in populations of 50+ individuals of various ages, 28 plants on the western side of the road and 58 plants on the sunnier eastern side. Populations may comprise a single cohort of individuals, or have a multi-aged structure where some individuals appear to be old with thickened runners.						
	Tylophora linearis	• Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. • Also grows in association with Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum species and Casuarina species. • Flowers in spring, with flowers recorded in November or May with fruiting probably 2 to 3 months later. • Very low number of confirmed populations and has been recorded in very low abundances.	V	E			Species or species habitat known to occur within area	Potential. Habitat suitable for this species has potential to occur in less disturbed remnants. It is likely that grazing cattle has reduced the likelihood of detecting this species in grazed areas.
Mauve Burr-daisy	*Calotis glandulosa*	• Found in montane and sub-alpine grasslands in the Australian Alps. • Found in subalpine grassland (dominated by Poa spp.), and montane or natural temperate grassland (dominated by Themeda australis) and Snow Gum (Eucalyptus pauciflora) Woodlands on the Monaro and Shoalhaven area. • Appears to be a coloniser of bare patches, which explains why it often occurs on roadsides. • Apparently common on roadsides in parts of the Monaro, though it does not persist for long in such sites.	V	V	Yes	Known		No. Suitable habitat for this species does not occur in the Project Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		• Does not persist in heavily-grazed pastures of the Monaro or the Shoalhaven area. • Dispersed by animals which carry the sticky burrs to new sites.						
Silky Swainson-pea	*Swainsona sericea*	• Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. • Found in Natural Temperate Grassland and Snow Gum Eucalyptus pauciflora Woodland on the Monaro. • Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. • Sometimes found in association with cypress-pines Callitris spp. • Habitat on plains unknown. • Regenerates from seed after fire.	V			Known		Likely. This species is likely to occur in better condition remnants of Box-Gum woodland.
Ausfeld's Wattle	*Acacia ausfeldii*	• Found to the east of Dubbo in the Mudgee, Ulan - Gulgong area of the NSW South Western Slopes bioregion, with some records in the adjoining Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions. Populations are recorded from Yarrobil National Park, Goodiman State Conservation Area and there is a 1963 record from Munghorn Gap Nature Reserve. A large population is also known from Tuckland State Forest to the northwest of Gulgong.	V			Known		Potential.
Grevillea divaricata	*Grevillea divaricata*	• Known only from the type collection made in 1823, north of Bathurst. Another specimen which is possibly part of the type collection, is from the Cox's River. • Grows in dry open forest. Specimen notes describe the plant as occurring frequently in dry open forest lands and as possibly growing	E			Predicted		No.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		on rocky river margins. • Flowers recorded in April, but the species probably also flowers in the spring months. • Plants possibly regenerate from lignotuber and sucker, either naturally or in response to fire. May also be capable of recruitment via rhizomes. • The fire response of the species is unknown, however type material appears to have been rhizomatous or lignotuberous and capable of semi-basal suckering. • Flowers are probably bird-pollinated.						
Clandulla Geebung	*Persoonia marginata*	• Known from only four disjunct locations on the Central Tablelands and Central Coast. Core of the species distribution is within Clandulla State Forest, west of Kandons. Disjunct populations occur.to the north at Dingo Creek and Mount Dangar within the Wollemi and Goulburn River National Parks.to the south within Ben Bullen State Forest, south-east of Capertee. To the south-east at Devils Hole, north of Colo Heights within Parr State Recreation Area.	V			Known		No. Suitable habitat for this species does not occur in the Project Area.
Philotheca ericifolia	*Philotheca ericifolia*	• Known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. The records are scattered over a range of over 400km between West Wyalong and the Pilliga Scrub. Site localities include Pilliga East State Forest, Goonoo State Forest, Hervey Range, Wingen Maid Nature Reserve, Toongi, Denman, Rylstone district and Kandos Weir. • Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. • Associated species include Melaleuca uncinata, Eucalyptus crebra, E. rossii, E. punctata, Corymbia trachyphloia, Acacia	Not Listed	V		Known		Yes. Previously occurred in the Mining Area and known to occur on Dowds Hill. It is likely that this species still exists on Dowds Hill, however previously cleared areas on alluvial soil and undulating farming ground are likely to have been cleared.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		triptera, A. burrowii, Beyeria viscosa, Philotheca australis, Leucopogon muticus and Calytrix tetragona. • Flowering time is in the spring. Fruits are produced from November to December. • Noted as being a "moisture-loving plant", with plants common on the sides of a particular spur of the Hervey Ranges where soakage from the high background provides sufficient moisture for the plants. • Also recorded growing in a recently burnt site (wildfire) and within a regeneration zone resulting from clearing. • Populations comprise from 3-12 adult plants to approx. 200 plants (mostly seedlings in one population). Also described as uncommon, scattered, common, locally occasional and locally frequent. Populations in Pilliga State Forest consist of hundreds or thousands of individuals. A very large population occurs in Lincoln State Forest near Gilgandra.						
Scant Pomaderris	*Pomaderris queenslandica*	• Widely scattered but not common in north-east NSW and in Queensland. It is only known from a few locations on the New England Tablelands and North West Slopes, including near Torrington and Coolatai, and also from several locations on the NSW north coast. • Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks.	E			Known		Potential to occur in gully areas associated with Dowds Hill. Unlikely to occur in the Mining Area.
Keith's Zieria	*Zieria ingramii*	• Known only from Goonoo Goonoo State Forest, about 40km north-east of Dubbo. An old record exists from a locality east of Mogriguy on the Mendooran Road, however searches of the area have not relocated the species. • Grows in dry sclerophyll forest on light sandy soils. All known populations have been	E	E		Known		Potential to occur in similar habitat to Rulingia procumbens on Dowds Hill. Unlikely to occur in the Mining Area.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		recorded in Eucalyptus-Callitris woodland or open forest with a shrubby to heathy understorey. • Mostly from gentle slopes in red-brown and yellow-brown sandy loams, often with a rocky surface. • Associated and understorey species include Eucalyptus crebra, Eucalyptus fibrosa, Eucalyptus dwyeri, Eucalyptus beyeriana, Eucalyptus microcarpa, Callitris endlicheri, Allocasuarina diminuta, Allocasuarina distyla, Allocasuarina verticillata, Leptospermum divaricatum, Leptospermum parvifolium, Acacia triptera, Acacia gladiiformis, Acacia brownii, Grevillea floribunda, Grevillea triternata, Hakea decurrens, Boronia glabra, Philotheca salsolifolia, Leucopogon attenuatus, Melaleuca uncinata, Melaleuca erubescens, Kunzea parvifolia, Calytrix tetragona, Brachyloma daphnoides, Melichrus urceolatus, Cassinia aculeata, Dodonaea viscosa subsp. spatulata, Dodonaea peduncularis, Dodonaea heteromorpha, Dillwynia sericea, Hibbertia riparia, Dampiera lanceolata, Dianella longifolia, Prostanthera species and Goodenia species. • Flowering time is in spring and plants bear fruit in summer. Plants can produce flowers and fruits any time between July and March. • Grows only in small localised populations within the north-east and central areas of Goonoo State Forest. Population sizes vary from 6 to 80 individuals. The age structure within populations may be even and single-aged or uneven and multi-aged.						
Zieria obcordata	*Zieria obcordata*	• Occurs at two sites with a geographic range of 105km. These are Bulbudgeree Station near Wellington, comprising of a single population of 77 plants and Crackerjack	E	E		Known		No.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	Central West Wildlife Atlas Records	OEH Threatened Species Search Predictions	DSEWPaC Protected Matters Search	Potential to occur
		Rock/Rock Forests area NW of Bathurst, comprising of five population across 3 sites, totalling to 259 plants. • Grows in eucalypt woodland or shrubland dominated by species of Acacia on rocky hillsides. Also occurs in Eucalyptus and Callitris dominated woodland with an open, low shrub understorey, on moderately steep, west to north-facing slopes in sandy loam amongst granite boulders. The altitude range of sites is 500m to 830m.						
Eucalyptus alligatrix sub sp.miscella	*Eucalyptus alligatrix subsp. miscella*	• Only known from a single area south-west of Rylstone	V	V		Known		No
Capertee Stringybark	*Eucalyptus cannonii*	• Eucalyptus cannonii is restricted to an area of about 100km by 60km in the central tablelands of NSW. The western border is approximately marked by a line between Bathurst and Mudgee, while the eastern locations occur approximately on a line between Lithgow and the town of Bylong. Within this area the species is often locally frequent.	V	V		Known		No.
Robertson's Peppermint	*Eucalyptus robertsonii subsp. hemisphaerica*	• Found only in the central tablelands of NSW, from sites to the E and SE of Bathurst and Orange. Specimen localities include Glengowan (Upper Meroo), Burraga, Mullion Creek area, west of Bocoble Mountain and Isobella River.	V	V		Known		No.

APPENDIX 4: FLORA RESULTS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

The following species list has been compiled from all species recorded in 26 biometric condition plots and opportunistic sightings. It is not a complete flora list for the Mining Area. The total number of native/exotic species recorded in each plot only includes those identified to species or genus level. The number of native species used for the credit calculations (**Appendix 8**) includes all native species recorded in the plot whether or not they have been identified to species level.

Flora species recorded

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Myrsinaceae	Scarlet/ Blue Pimpernal	*Anagallis arvensis* *	*		x										
Scrophulariaceae	Broomrape	*Orobanche minor* *	*												
Asteraceae	Cape Weed	*Arctotheca calendula* *	*	x			x		x	x	x	x	x	x	
Asteraceae	Nodding Thistle	*Carduus nutans subsp. nutans*	*#												
Asteraceae	Saffron Thistle	*Carthamus lanatus* *	*	x					x				x		x
Asteraceae	Maltese Cockspur	*Centaurea melitensis**	*	x											
Asteraceae	Spear Thistle	*Cirsium vulgare* *	*												
Asteraceae	Flax-leaf Fleabane	*Conyza bonariensis*	*								x				x
Asteraceae		*Hedypnois rhagadioloides ssp. cretica* *	*												
Asteraceae	Flatweed	*Hypochaeris glabra* *	*			x		x							
Asteraceae	Flatweed hairy	*Hypochaeris radicata**	*	x	x		x			x		x	x		
Asteraceae	Hawkweed	*Leotodon taraxacoides**	*				x	x					x		
Asteraceae	Variegated Thistle	*Silybum marianum* *	*							x					
Asteraceae		*Sisymbrium erysimoides*	*												
Asteraceae	Scourweed	*Sisyrinchium sp. A sensu*	*										x		
Asteraceae	Prickly Cow Thistle	*Sonchus asper*	*												
Asteraceae	Common Sow Thistle	*Sonchus oleraceus*	*	x			x		x	x	x	x		x	
Asteraceae	Stagger Weed	*Stachys arvensis*	*									x		x	
Asteraceae	Skeleton Weed	*Chondrilla juncea*	*												
Boraginaceae		*Amsinckia intermedia*	*												
Boraginaceae	Paterson's Curse	*Echium plantagineum* *	*	x				x	x				x		
Boraginaceae	Vipers Bugloss	*Echium vulgare**	*								x				
Boraginaceae	Potato Weed	*Heliotropium europaeum**	*			x									
Brassicaceae	Turnip	*Brassica rapa subsp. sylvestris**	*									x			
Brassicaceae	Brassica	*Brassica tournefortii* *	*					x			x	x		x	

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Brassicaceae	Shepherd's Purse	*Capsella bursa-pastoris**	*					x	x	x	x			x	
Brassicaceae	Argentine Peppercress	*Lepidium africanum**	*								x	x			
Brassicaceae	Peppercress	*Lepidium bonariense**	*	x	x										
Cactaceae	Prickly Pear	*Opuntia stricta*	*#												
Caryophyllaceae		*Silene gallica var. gallica **	*												
Caryophyllaceae		*Stellaria media **	*												
Caryophyllaceae	Proliferous Pink	*Petrorhagia nanteuilii*	*												
Cucurbitaceae	Paddy Melon	*Cucumis myriocarpus subsp. leptodermis*	*												
Fabaceae - Faboideae	Haresfoot clover	*Trifolium arvense **	*						x		x		x		x
Fabaceae - Faboideae		*Trifolium campestre **	*												
Fabaceae - Faboideae		*Trifolium dubium **	*						x				x		
Fabaceae - Faboideae	White Clover	*Trifolium repens **	*												
Fabaceae - Faboideae		*Trifolium subterraneum **	*	x				x	x		x				x
Fabaceae (Faboideae)		*Medicago arabica**	*			x						x			
Fabaceae (Faboideae)		*Medicago minima **	*											x	x
Fabaceae (Faboideae)	Lucerne	*Medicago sativa **	*												
Geraniaceae		*Geranium spp.**	*												
Juncaceae		*Juncus bufonius **	*												
Lamiaceae		*Lamium amplexicaule **	*												
Lamiaceae	White Horehound	*Marrubium vulgare**	*					x			x	x			
Lamiaceae	Pennyroyal	*Mentha pulegium**	*												
Lamiaceae	Vervain	*Salvia verbenaca**	*			x		x		x			x		
Malvaceae	Spiked Malvastrum	*Malvastrum americanum*	*												
Oxalidaceae	Oxalis	*Oxalis corniculata**	*	x											
Poaceae	Great Brome	*Bromus diandrus*	*												
Poaceae	Praire Grass	*Bromus cartharticus**	*												
Poaceae	Soft Brome	*Bromus molliformis **	*	x		x		x	x		x		x		x
Poaceae	Small Quaker Grass	*Briza minor*	*												
Poaceae	Quaker Grass	*Briza major*	*												
Poaceae	Stinkgrass	*Eragrostis cilianensis**	*	x					x	x	x				

Family	Common Name	*Scientific Name*	*Weed Status*	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12
Poaceae	Barley Grass	*Hordeum leporinum* *	*	x				x	x		x	x		x	
Poaceae	Oats	*Avena fatua*	*										x		
Poaceae	Golden Top	*Lamarckia aurea* *	*							x	x				
Poaceae	Perennial Rye	*Lolium perennens*	*												
Poaceae	Wimera Ryegrass	*Lolium rigidum**	*									x			
Poaceae	Squirrel Tail Fescue	*Vulpia bromoides* *	*												
Poaceae	Rhodes Grass	*Chloris virgata*	*												
Poaceae		*Vulpia myuros* *	*												
Solanaceae	Blackberry Nightshade	*Solanum nigram*	*												
Solanaceae	African Boxthorn	*Lycium ferocissimum*	*#												
Urticaceae	Small Nettle	*Urtica urens**	*							x	x			x	
Verbenaceae	Purpletop	*Verbena bonariensis**	*	x											
Asteraceae.	Nagoora Burr	*Xanthium pungens**	*#					x	x	x	x			x	
Apiaceae	Native Carrot	*Daucus glochidiatus*			x		x		x		x	x	x		
Dilleniaceae	Guinea flower	*Hibbertia sp.*													
Polygonaceae	Slender Dock	*Rumex brownii*				x		x		x			x	x	
Rubiaceae		*Pomax umbellata*													
Amaranthaceae	Hairy Joyweed	*Alternanthera nana*													
Amaranthaceae	Khaki Weed	*Alternanthera pungens*													
Anthericaceae	Twining Fringe Lily	*Thysanotus patersonii*													
Anthericaceae	Common Fringe Lily	*Thysanotus tuberosus*										x			
Asparagaceae		*Dichopogon fimbriatus*								x	x	x			
Asphodelaceae		*Bulbine bulbosa*													
Asphodelaceae	Leek Lily	*Bulbine semibarbata*			x						x	x			
Asteraceae		*Asteraceae sp.*			**X**										
Asteraceae	Purple Burr-daisy	*Calotis cuneifolia*		x	x				x			x	x		
Asteraceae	Showy Burr-daisy	*Calotis cymbacantha*								x					
Asteraceae	Yellow Burr-daisy	*Calotis lappulacea*		x			x		x	x	x	x	x	x	
Asteraceae	Bogan Flea	*Calotis hispidula*													
Asteraceae		*Cassinia arcuata*				x									
Asteraceae		*Cassinia arculeata*													

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Asteraceae		*Cassinia leavis*													
Asteraceae	Common Sneezeweed	*Centipeda cunninghamii*				x									
Asteraceae		*Chrysocephalum apiculatum*													
Asteraceae	Tall Fleabane	*Conzya alibida*					x								
Asteraceae	Bears Ear	*Cymbonotus preissianus*				x			x						x
Asteraceae		*Cynoglossum australe*			x										
Asteraceae	Small Orange Sunray	*Hyalosperma semisterile*					x				x		x		
Asteraceae		*Hydrocotyle laxiflora*													
Asteraceae	Yam Daisy	*Microseris lanceolata*													
Asteraceae	Sunray	*Rhodanthe diffusa ssp. leucactina*		x	x	x	x				x				
Asteraceae	Tall Groundsel	*Senecio quadridentatus*						x							
Asteraceae	Common Sunray	*Triptilodiscus pygmaeus*		x	x		x	x	x		x	x	x		
Asteraceae		*Vittadinia cervicularis var. cervicularis*		x	x	x									
Asteraceae		*Vittadinia cuneata var. cuneata*				x	x	x			x			x	
Asteraceae		*Vittadinia cuneata var. hirsute*													
Asteraceae	Golden Everlasting	*Xerochrysum bracteata*					x				x	x			
Asteraceae	Sticky Everlasting	*Xerochrysum viscosa*					x								
Boraginaceae		*Cynoglossum suaveolens*													
Brassicaceae		*Brassica nigra*													
Brassicaceae		*Lepidium sp.*													
Campanulaceae		*Wahlenbergia communis*				x					x	x		x	
Campanulaceae		*Wahlenbergia gracilis*													
Campanulaceae		*Wahlenbergia stricta spp stricta*													
Caryophyllaceae	Mouse-ear Chickweed	*Cerastium glomeratum*									x				x
Casuarinaceae	Hill Oak	*Allocasuarina verticillata*													
Centrolepidaceae		*Centrolepis strigosa subsp. strigosa*			x										
Chenopodiaceae	Climbing Saltbush	*Einadia hastata*			x										
Chenopodiaceae	Creeping Saltbush	*Einadia nutans subs. Nutans*				x	x	x			x	x		x	
Chenopodiaceae		*Enchylaena tomentosa*													

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Chenopodiaceae	Eastern Cotton Bush	*Maireana microphylla.*		x			x	x	x	x				x	x
Colchicaceae	Early Nancy	*Wurmbea dioica*			x		x								
Convolvulaceae	Kidney Weed	*Dichondra repens*			x						x	x			x
Crassulaceae	Dense Stonecrop	*Crassula colorata*									x	x	x	x	x
Crassulaceae	Australian Stonecrop	*Crassula sieberiana*		x				x	x						
Cupressaceae	White Cypress Pine	*Callitris endlicheri*			x	x	X				x	x		x	
Cupressaceae	Black Cypress Pine	*Callitris glaucophylla*													
Cyperaceae		*Cyperus sp.*													
Cyperaceae		*Carex inversa*													
Cyperaceae	Tall sedge	*Carex appressa*													
Cyperaceae	Rough Sas Sedge	*Gahnia aspera*													
Cyperaceae	Common Bog Rush	*Shoenus apogon*													
Droseraceae	Sundew	*Drosera peltata*										x			
Euphorbiaceae	Caustic Weed	*Euphorbia drummondii*				x						x			
Fabaceae - Faboideae	Slender Tick-trefoil	*Desmodium varians*			x		x					x			
Fabaceae - Faboideae	Kneed Swainson-pea	*Swainsona reticulata*			x										
Fabaceae - Faboideae	Leafy Stenophylla	*Templetonia stenophylla*			x										
Fabaceae - Faboideae	Woolly Clover	*Trifolium tomentosum*													
Fabaceae - Mimosoideae		*Acacia cheelii*													
Fabaceae - Mimosoideae		*Acacia deanei subsp. deanei*													
Fabaceae - Mimosoideae	Western Golden Wattle	*Acacia decora*				x									
Fabaceae - Mimosoideae	Currawang	*Acacia doratoloxyn*													
Fabaceae - Mimosoideae		*Acacia implexa ?*													
Fabaceae - Mimosoideae	Boree	*Acacia vestita*													
Fabaceae - Mimosoideae		*Acacia lineata*													
Fabaceae - Mimosoideae	Mudgee Wattle	*Acacia spectabilis*													

Family	Common Name	*Scientific Name*	*Weed Status*	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12
Fabaceae - Mimosoideae	Sword-leaf Wattle	*Acacia gladiiformis*													
Fabaceae (Faboideae)	Twining Glycine	*Glycine clandestina*			x	x									
Fabaceae (Faboideae)		*Glycine latifolia*					x								
Fabaceae (Faboideae)		*Glycine tabacina*			x							x			
Fabaceae (Faboideae)		*Glycine tomentosa / canescens*													
Fabaceae (Faboideae)	Burr Medic	*Medicago polymorpha*		x	x			x	x	x		x			
Fabaceae (Faboideae)		*Mirbelia pungens*													
Fabaceae (Faboideae)	Small-leaf Bush-pea	*Pultenaea foliolosa*				x									
Fabaceae (Faboideae)		*Pultenaea microphylla*													
Fabaceae (Faboideae)	Senna	*Senna artemisioides subsp. zygophylla*													
Fabaceae (Faboideae)	Silver cassia	*Senna artemisioides*													
Fumariaceae	Narrow-leaved Fumitory	*Fumaria densiflora*					x				x	x			
Geraniaceae	Blue Crowfoot	*Erodium crinitum*										x		x	
Geraniaceae		*Geranium homeanum*													
Geraniaceae		*Geranium retorsum*											x		
Geraniaceae		*Geranium solanderi var. solanderi*								x					
Geraniaceae	Native Stork bill	*Pelagonium australe*													
Goodeniaceae		*Goodenia hederacea ssp. hederacea*				x									
Haloragaceae		*Gonocarpus elatus [Hill Raspwort]*													
Haloragaceae	Toothed Raspwort	*Halogaris odontocarpa*													
Hypoxidaceae	Tiny Star	*Hypoxis glabella var. glabella*			x	x									
Juncaceae		*Juncas arcutus*											x		x
Juncaceae		*Juncas arculeata*													
Juncaceae		*Juncus aridicola*		x	x			x	x				x	x	x
Juncaceae		*Juncas sp.*													
Lamiaceae	Austral Bugle	*Ajuga australis*								x					
Lamiaceae	Native Pennyroyal	*Mentha satureioides*													
Linaceae		*Linum marginale*													

Family	Common Name	*Scientific Name*	*Weed Status*	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12
Lobeliaceae		*Isotoma axillaris*													
Lomandraceae		*Lomandra filiformis ssp. coriacea*		x											
Lomandraceae	Spiky-headed Matt Rush	*Lomandra longifolia*													
Lomandraceae	Many-flowered matt Rush	*Lomandra multiflora subsp. Multiflora*			x	x	x	x							
Malvaceae	Small-flowered mallow	*Malva parvifolia*								x				x	
Malvaceae		*Sida corrugata*													
Myrtaceae	White Box	*Eucalyptus albens*					x	x						x	
Myrtaceae	Fuzzy Box	*Eucalyptus conica*													
Myrtaceae	Tumbledown Red Gum	*Eucalyptus dealbata*								x	x	x			
Myrtaceae	Dwyer's Red Gum	*Eucalyptus Dwyeri*				x									
Myrtaceae	Yellow Box	*Eucalyptus melliodora*													
Myrtaceae	Inland Grey Box	*Eucalyptus microcarpa*				x	x								
Myoporaceae	Winter Apple	*Eremophila debilis*													
Orchidaceae	Pink Fingers	*Caladenia carnea*				x									
Orchidaceae	Tiger Orchid	*Diuris sulphurea*													
Orchidaceae		*Microtis unifolia*													
Orchidaceae		*Pterostylis bicolor*													
Orchidaceae	Midget Greenhood	*Pterostylis mutica*													
Orchidaceae	Dwarf Greenhood	*Pterostylis nana*													
Orchidaceae	Autumn Greenhood	*Pterostylis revoluta*													
Oxalidaceae		*Oxalis perennans*											x		
Oxalidaceae		*Oxalis radicosa*													
Papaveraceae	Mexican Poppy	*Argemone ochroleuca*													
Phormiaceae		*Dianella revoluta subsp.*													
Pittosporaceae	Butterbush	*Pittosporum angustifolium*													
Plantaginaceae	Small Sago Weed	*Plantago turrifera*			x										
Poaceae	Purple Wiregrass	*Aristida jerichoensis*				x	x			x	x				
Poaceae		*Aristida ramosa*		x	x	x		x	x				x	x	x
Poaceae	Wallaby Grass	*Austrodanthonia erianthia*										x			
Poaceae	Common Wallaby Grass	*Austrodanthonia caespitosa*													

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Poaceae		*Austrodanthonia sp.*													
Poaceae	Wallaby Grass	*Austrodanthonia bipartita*													
Poaceae	Dense Foxtail Grass	*Austrostipa densiflora*									x	x			
Poaceae	Rough Spear Grass	*Austrostipa scabra subs scabra*		x	x	x	x		x	x	x	x	x	x	
Poaceae		*Austrostipa ramosa*													
Poaceae	Spear Grass	*Austrostipa sp.*													
Poaceae	Slender Bamboo Grass	*Austrostipa verticillata*			x		x		x	x				x	
Poaceae	Red-Leg Grass	*Bothriochloa macra*			x								x		x
Poaceae		*Chloris truncata*		x				x							
Poaceae	Tall Chloris	*Chloris ventricosa*													
Poaceae		*Cynodon dactylon*						x							
Poaceae	Queensland Bluegrass	*Dichanthium serecium*													
Poaceae		*Dichelachne micrantha*										x			
Poaceae	Cotton Panic	*Digitaria brownii*					x	x	x						x
Poaceae		*Digitaria sp.*													
Poaceae	Awnless barnyard Grass	*Echinochloa colona*													
Poaceae	Common Wheatgrass	*Elymus scaber*									x				
Poaceae	Slender bottlewashers	*Ennaepogon gracilis*										x			
Poaceae	Curly Windmill Grass	*Enteropogon acicularis*													
Poaceae	Brown Lovegrass	*Eragrostis brownii*													
Poaceae	Purple Love Grass	*Eragrostis lacunaria*						x			x			x	
Poaceae	Hairy Panic	*Panicum effusum*		x	x	x	x	x	x		x	x	x		
Poaceae		*Poa sieberiana*						x							
Poaceae	Western Rat's Tail Grass	*Sporobolus crebra*		x	x			x					x	x	x
Poaceae		*Thyridolepis mitchelliana*				x									
Poaceae	Five-minute Grass	*Tripogon loliformis*										x			
Proteaceae	Hooked Needlewood	*Hakea tephrosperma*													
Pteridaceae	Rock Fern	*Cheilanthes austrotenuifolia*					x								
Pteridaceae	Mulga Fern	*Cheilanthes sieberi*			x	x					x	x	x		
Sapindaceae		*Dodonaea boroniifolia*				x									

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
Sapindaceae	Hopbush	*Dodonaea sp.*			x	x									
Sapindaceae	Narrow-leafed hopbush	*Dodonaea viscosa subsp. augustissim*				x									
Sapindaceae		*Dodonaea viscosa subsp. cuneata*			x										
Solanaceae	Narrawa Burr	*Solanum cinereum*													
Violaceae	Slender violet-bush	*Hybanthus monopetalus*													
Santalaceae	Cherry Ballart	*Exocarpus cupressiformis*													
	TOTAL Species	*234*	*67*	*28*	*34*	*34*	*29*	*30*	*26*	*23*	*40*	*40*	*28*	*26*	*17*
			Weed Status	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Plot 9**	**Plot 10**	**Plot 11**	**Plot 12**
		Native Plant Species (NPS)		15	32	29	25	19	14	13	24	29	17	17	11
		No. Native Ground Cover		15	31	25	22	18	14	12	22	27	17	15	11
		No. Groundcover weeds		13	3	5	4	11	12	10	16	11	11	9	6
		% Weed in groundcover		87%	10%	20%	18%	61%	86%	83%	73%	41%	65%	60%	55%

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Myrsinaceae	Scarlet/ Blue Pimpernal	*Anagallis arvensis* *	*														
Scrophulariaceae	Broomrape	*Orobanche minor* *	*														
Asteraceae	Cape Weed	*Arctotheca calendula* *	*			x				x					x		
Asteraceae	Nodding Thistle	*Carduus nutans subsp. nutans*	*#														x
Asteraceae	Saffron Thistle	*Carthamus lanatus* *	*	x		x	x	x		x			x	x			x
Asteraceae	Maltese Cockspur	*Centaurea melitensis**	*			x											
Asteraceae	Spear Thistle	*Cirsium vulgare* *	*														x
Asteraceae	Flax-leaf Fleabane	*Conyza bonariensis*	*														
Asteraceae		*Hedypnois rhagadioloides ssp. cretica* *	*			x											
Asteraceae	Flatweed	*Hypochaeris glabra* *	*					x							x		
Asteraceae	Flatweed hairy	*Hypochaeris radicata**	*	x	x				x								
Asteraceae	Hawkweed	*Leotodon taraxacoides**	*														
Asteraceae	Varigated Thistle	*Silybum marianum* *	*							x							

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Asteraceae		*Sisymbrium erysimoides*	*														
Asteraceae	Scourweed	*Sisyrinchium sp. A sensu*	*														
Asteraceae	Prickly Cow Thistle	*Sonchus asper*	*	x	x					x	x			x			
Asteraceae	Common Sow Thistle	*Sonchus oleraceus*	*				x					x	x	x			
Asteraceae	Stagger Weed	*Stachys arvensis*	*														
Asteraceae	Skeleton Weed	*Chondrilla juncea*	*													x	
Boraginaceae		*Amsinckia intermedia*	*														
Boraginaceae	Paterson's Curse	*Echium plantagineum* *	*	x		x									x		
Boraginaceae	Vipers Bugloss	*Echium vulgare**	*														
Boraginaceae	Potato Weed	*Heliotropium europaeum**	*														
Brassicaceae	Turnip	*Brassica rapa subsp. sylvestris**	*														
Brassicaceae	Brassica	*Brassica tournefortii* *	*														
Brassicaceae	Shepherd's Purse	*Capsella bursa-pastoris**	*	x		x	x			x		x					
Brassicaceae	Argentine Peppercress	*Lepidium africanum**	*					x					x				
Brassicaceae	Peppercress	*Lepidium bonariense**	*									x				x	
Cactaceae	Prickly Pear	*Opuntia stricta*	*#														x
Caryophyllaceae		*Silene gallica var. gallica* *	*														
Caryophyllaceae		*Stellaria media* *	*										x				
Caryophyllaceae	Proliferous Pink	*Petrorhagia nanteuilii*	*														x
Cucurbitaceae	Paddy Melon	*Cucumis myriocarpus subsp. leptodermis*	*										x				
Fabaceae - Faboideae	Haresfoot clover	*Trifolium arvense* *	*								x				x		
Fabaceae - Faboideae		*Trifolium campestre* *	*														
Fabaceae - Faboideae		*Trifolium dubium* *	*														
Fabaceae - Faboideae	White Clover	*Trifolium repens* *	*							x		x					
Fabaceae - Faboideae		*Trifolium subterraneum* *	*	x	x	x		x					x		x		
Fabaceae (Faboideae)		*Medicago arabica**	*				x										

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Fabaceae (Faboideae)		*Medicago minima* *	*				x										
Fabaceae (Faboideae)	Lucerne	*Medicago sativa* *	*										x	x		x	
Geraniaceae		*Geranium spp.**	*														
Juncaceae		*Juncus bufonius* *	*														
Lamiaceae		*Lamium amplexicaule* *	*														
Lamiaceae	White Horehound	*Marrubium vulgare**	*														x
Lamiaceae	Pennyroyal	*Mentha pulegium**	*														
Lamiaceae	Vervain	*Salvia verbenaca**	*		x		x	x									
Malvaceae	Spiked Malvastrum	*Malvastrum americanum*	*									X				x	
Oxalidaceae	Oxalis	*Oxalis corniculata**	*														
Poaceae	Great Brome	*Bromus diandrus*	*													x	x
Poaceae	Praire Grass	*Bromus cartharticus**	*									x					
Poaceae	Soft Brome	*Bromus molliformis* *	*	x	x		x	x		x		x	x	x			
Poaceae	Small Quaker Grass	*Briza minor*	*													x	
Poaceae	Quaker Grass	*Briza major*	*													x	
Poaceae	Stinkgrass	*Eragrostis cilianensis**	*		x	x	x	x				x	x				
Poaceae	Barley Grass	*Hordeum leporinum* *	*	x		x				x		x					
Poaceae	Oats	*Avena fatua*	*	x							x		x			x	x
Poaceae	Golden Top	*Lamarckia aurea* *	*														
Poaceae	Perennial Rye	*Lolium perennens*	*													x	
Poaceae	Wimera Ryegrass	*Lolium rigidum**	*										x				
Poaceae	Squirrel Tail Fescue	*Vulpia bromoides* *	*														
Poaceae	Rhodes Grass	*Chloris virgata*	*													x	
Poaceae		*Vulpia myuros* *	*					x				x	x				
Solanaceae	Blackberry Nightshade	*Solanum nigram*	*									x					
Solanaceae	African Boxthorn	*Lycium ferocissimum*	*#														
Urticaceae	Small Nettle	*Urtica urens**	*														
Verbenaceae	Purpletop	*Verbena bonariensis**	*													x	x
Asteraceae.	Nagoora Burr	*Xanthium pungens**	*#							x							
Apiaceae	Native Carrot	*Daucus glochidiatus*		x	x				x		x						

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Dilleniaceae	Guinea flower	*Hibbertia sp.*			x				x		x						
Polygonaceae	Slender Dock	*Rumex brownii*			x				x								
Rubiaceae		*Pomax umbellata*			x												
Amaranthaceae	Hairy Joyweed	*Alternanthera nana*													x		
Amaranthaceae	Khaki Weed	*Alternanthera pungens*					x					x					
Anthericaceae	Twining Fringe Lily	*Thysanotus patersonii*							x						x		
Anthericaceae	Common Fringe Lily	*Thysanotus tuberosus*															
Asparagaceae		*Dichopogon fimbriatus*			x				x		x						
Asphodelaceae		*Bulbine bulbosa*							x								
Asphodelaceae	Leek Lily	*Bulbine semibarbata*			x				x		x						
Asteraceae		*Asteraceae sp.*															
Asteraceae	Purple Burr-daisy	*Calotis cuneifolia*									x					x	x
Asteraceae	Showy Burr-daisy	*Calotis cymbacantha*															
Asteraceae	Yellow Burr-daisy	*Calotis lappulacea*		x		x	x									x	
Asteraceae	Bogan Flea	*Calotis hispidula*														x	
Asteraceae		*Cassinia arcuata*															
Asteraceae		*Cassinia arculeata*			x						x						
Asteraceae		*Cassinia leavis*														x	x
Asteraceae	Common Sneezeweed	*Centipeda cunninghamii*															
Asteraceae		*Chrysocephalum apiculatum*														x	
Asteraceae	Tall Fleabane	*Conzya alibida*							x					x			
Asteraceae	Bears Ear	*Cymbonotus preissianus*			x												
Asteraceae		*Cynoglossum australe*															
Asteraceae	Small Orange Sunray	*Hyalosperma semisterile*															
Asteraceae		*Hydrocotyle laxiflora*							x								
Asteraceae	Yam Daisy	*Microseris lanceolata*															
Asteraceae	Sunray	*Rhodanthe diffusa ssp. leucactina*			x				x		x						
Asteraceae	Tall Grounsel	*Senecio quadridentatus*					x		x			x			x		
Asteraceae	Common Sunray	*Triptilodiscus pygmaeus*			x												
Asteraceae		*Vittadinia cervicularis var. cervicularis*			x							x	x				

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Asteraceae		*Vittadinia cuneata var. cuneata*			x				x					x		x	x
Asteraceae		*Vittadinia cuneata var. hirsute*					x										
Asteraceae	Golden Everlasting	*Xerochrysum bracteata*					x										
Asteraceae	Sticky Everlasting	*Xerochrysum viscosa*														x	x
Boraginaceae		*Cynoglossum suaveolens*															
Brassicaceae		*Brassica nigra*										x					
Brassicaceae		*Lepdiium sp.*													x		
Campanulaceae		*Wahlenbergia communis*													x		
Campanulaceae		*Wahlenbergia gracilis*															
Campanulaceae		*Wahlenbergia stricta ssp stricta*			x												x
Caryophyllaceae	Mouse-ear Chickweed	*Cerastium glomeratum*		x	x	x			x		x						
Casuarinaceae	Hill Oak	*Allocasuarina verticillata*													x		
Centrolepidaceae		*Centrolepis strigosa subsp. strigosa*															
Chenopodiaceae	Climbing Saltbush	*Einadia hastata*														x	x
Chenopodiaceae	Creeping Saltbush	*Einadia nutans subs. Nutans*			x		x								x	x	x
Chenopodiaceae		*Enchylaena tomentosa*														x	
Chenopodiaceae	Eastern Cotton Bush	*Maireana microphylla.*				x		x							x	x	
Colchicaceae	Early nancy	*Wurmbea dioica*															
Convolvulaceae	Kidney Weed	*Dichondra repens*		x					x		x				x		
Crassulaceae	Dense Stonecrop	*Crassula colorata*		x	x	x									x		
Crassulaceae	Australian Stonecrop	*Crassula sieberiana*															
Cupressaceae	White Cypress Pine	*Callitris endlicheri*			x				x		x				x	x	x
Cupressaceae	Black Cypress Pine	*Callitris glaucophylla*			x				x								
Cyperaceae		*Cyperus sp.*													x		
Cyperaceae		*Carex inversa*															x
Cyperaceae	Tall sedge	*Carex appressa*														x	
Cyperaceae	Rough Sas Sedge	*Gahnia aspera*															
Cyperaceae	Common Bog Rush	*Shoenus apogon*													x		
Droseraceae	Sundew	*Drosera peltata*							x		x						
Euphorbiaceae	Caustic Weed	*Euphorbia drummondii*															

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Fabaceae - Faboideae	Slender Tick-trefoil	*Desmodium varians*															x
Fabaceae - Faboideae	Kneed Swainson-pea	*Swainsona reticulata*															
Fabaceae - Faboideae	Leafy Stenophylla	*Templetonia stenophylla*															
Fabaceae - Faboideae	Woolly Clover	*Trifolium tomentosum*				x									x		
Fabaceae - Mimosoideae		*Acacia cheelii*							x								
Fabaceae - Mimosoideae		*Acacia deanei subsp. deanei*							x								
Fabaceae - Mimosoideae	Western Golden Wattle	*Acacia decora*							x								x
Fabaceae - Mimosoideae	Currawang	*Acacia doratoloxyn*									x						
Fabaceae - Mimosoideae		*Acacia implexa ?*							x		x						
Fabaceae - Mimosoideae	Boree	*Acacia vestita*							x								
Fabaceae - Mimosoideae		*Acacia lineata*															x
Fabaceae - Mimosoideae	Mudgee Wattle	*Acacia spectabilis*															x
Fabaceae - Mimosoideae	Sword-leaf Wattle	*Acacia gladiformis*															x
Fabaceae (Faboideae)	Twining Glycine	*Glycine clandestina*															x
Fabaceae (Faboideae)		*Glycine latifolia*															
Fabaceae (Faboideae)		*Glycine tabacina*															
Fabaceae (Faboideae)		*Glycine tomentosa / canescens*															
Fabaceae (Faboideae)	Burr Medic	*Medicago polymorpha*		x		x	x	x		x	x	x	x				

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Fabaceae (Faboideae)		*Mirbelia pungens*			x												
Fabaceae (Faboideae)	Small-leaf Bush-pea	*Pultenaea foliolosa*															
Fabaceae (Faboideae)		*Pultenaea microphylla*							x								
Fabaceae (Faboideae)	Senna	*Senna artemisioides subsp. zygophylla*								x						x	
Fabaceae (Faboideae)	Silver cassia	*Senna artemisioides*														x	x
Fumariaceae	Narrow-leaved Fumitory	*Fumaria densiflora*			x		x								x		
Geraniaceae	Blue Crowfoot	*Erodium crinitum*		x	x		x		x	x							
Geraniaceae		*Geranium homeanum*															
Geraniaceae		*Geranium retorsum*															
Geraniaceae		*Geranium solanderi var. solanderi*															
Geraniaceae	Native Stork bill	*Pelagonium australe*											x				
Goodeniaceae		*Goodenia hederacea ssp. hederacea*															
Haloragaceae		*Gonocarpus elatus [Hill Raspwort]*															
Haloragaceae	Toothed Raspwort	*Halogaris odontocarpa*							x								
Hypoxidaceae	Tiny Star	*Hypoxis glabella var. glabella*															
Juncaceae		*Juncas arcutus*				x										x	
Juncaceae		*Juncas arculeata*															x
Juncaceae		*Juncus aridicola*		x		x									x	x	
Juncaceae		*Juncas sp.*															x
Lamiaceae	Austral Bugle	*Ajuga australis*					?	x									
Lamiaceae	Native Pennyroyal	*Mentha satureioides*															
Linaceae		*Linum marginale*															
Lobeliaceae		*Isotoma axillaris*															
Lomandraceae		*Lomandra filiformis ssp. coriacea*															
Lomandraceae	Spiky-headed Matt Rush	*Lomandra longifolia*															

Family	Common Name	*Scientific Name*	*Weed Status*	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26
Lomandraceae	Many-flowered matt Rush	*Lomandra multiflora subsp. Multiflora*			x												x
Malvaceae	Small-flowered mallow	*Malva parvifolia*					x		x			x	x				
Malvaceae		*Sida corrugata*														x	x
Myrtaceae	White Box	*Eucalyptus albens*					x					x			x		x
Myrtaceae	Fuzzy Box	*Eucalyptus conica*															
Myrtaceae	Tumbledown Red Gum	*Eucalyptus dealbata*			x				x		x						
Myrtaceae	Dwyer's Red Gum	*Eucalyptus Dwyeri*															
Myrtaceae	Yellow Box	*Eucalyptus melliodora*															
Myrtaceae	Inland Grey Box	*Eucalyptus microcarpa*													x	x	x
Myoporaceae	Winter Apple	*Eremophila debilis*														x	x
Orchidaceae	Pink Fingers	*Caladenia carnea*									x						
Orchidaceae	Tiger Orchid	*Diuris sulphurea*															
Orchidaceae		*Microtis unifolia*															
Orchidaceae		*Pterostylis bicolor*									x						
Orchidaceae	Midget Greenhood	*Pterostylis mutica*															
Orchidaceae	Dwarf Greenhood	*Pterostylis nana*															
Orchidaceae	Autumn Greenhood	*Pterostylis revoluta*									x						
Oxalidaceae		*Oxalis perennans*					x										
Oxalidaceae		*Oxalis radicosa*				x											
Papaveraceae	Mexican Poppy	*Argemone ochroleuca*										x					
Phormiaceae		*Dianella revoluta subsp.*														x	
Pittosporaceae	Butterbush	*Pittosporum angustifolium*														x	
Plantaginaceae	Small Sago Weed	*Plantago turrifera*															
Poaceae	Purple Wiregrass	*Aristida jerichoensis*							x							x	x
Poaceae		*Aristida ramosa*		x	x	x	x	x	x		x	x			x		x
Poaceae	Wallaby Grass	*Austrodanthonia erianthia*								x	x						
Poaceae	Common Wallaby Grass	*Austrodanthonia caespitosa*														x	
Poaceae		*Austrodanthonia sp.*														x	x
Poaceae	Wallaby Grass	*Austrodanthonia bipartita*															x
Poaceae	Dense Foxtail Grass	*Austrostipa densiflora*			x				x		x						

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Poaceae	Rough Spear Grass	*Austrostipa scabra subs scabra*		x	x	x	x		x		x				x	x	x
Poaceae		*Austrostipa ramosa*														x	
Poaceae	Spear Grass	*Austrostipa sp.*												x			x
Poaceae	Slender Bamboo Grass	*Austrostipa verticillata*							x							x	x
Poaceae	Red-Leg Grass	*Bothriochloa macra*				x	x	x		x			x	x	x	x	
Poaceae		*Chloris truncata*		x													
Poaceae	Tall Chloris	*Chloris ventricosa*														x	x
Poaceae		*Cynodon dactylon*															
Poaceae	Queensland Bluegrass	*Dichanthium serecium*		x			x										
Poaceae		*Dichelachne micrantha*			x				x								
Poaceae	Cotton Panic	*Digitaria brownii*											x			x	
Poaceae		*Digitaria sp.*						x									
Poaceae	Awnless barnyard Grass	*Echinochloa colona*									x						
Poaceae	Common Wheatgrass	*Elymus scaber*					x	x				x				x	x
Poaceae	Slender bottlewashers	*Ennaepogon gracilis*															
Poaceae	Curly Windmill Grass	*Enteropogon acicularis*														x	x
Poaceae	Brown Lovegrass	*Eragrostis brownii*										x					
Poaceae	Purple Love Grass	*Eragrostis lacunaria*			x						x						
Poaceae	Hairy Panic	*Panicum effusum*			x				x		x					x	x
Poaceae		*Poa sieberiana*						x	x							x	x
Poaceae	Western Rat's Tail Grass	*Sporobolus crebra*															
Poaceae		*Thyridolepis mitchelliana*			x												
Poaceae	Five-minute Grass	*Tripogon loliformis*							x		x						
Proteaceae	Hooked Needlewood	*Hakea tephrosperma*							x								
Pteridaceae	Rock Fern	*Cheilanthes austrotenuifolia*			**x**											x	
Pteridaceae	Mulga Fern	*Cheilanthes sieberi*							x		x						
Sapindaceae		*Dodonaea boroniifolia*															
Sapindaceae	Hopbush	*Dodonaea sp.*															

Family	Common Name	*Scientific Name*	*Weed Status*	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
Sapindaceae	Narrow-leafed hopbush	*Dodonaea viscosa subsp. augustissim*															
Sapindaceae		*Dodonaea viscosa subsp. cuneata*							x								
Solanaceae	Narrawa Burr	*Solanum cinereum*			x							x					
Violaceae	Slender violet-bush	*Hybanthus monopetalus*									x						
Santalaceae	Cherry Ballart	*Exocarpus cupressiformis*															
	TOTAL Species	*234*	*67*	*21*	*38*	*21*	*26*	*16*	*40*	*14*	*31*	*23*	*18*	*9*	*26*	*47*	*44*
			Weed Status	**Plot 13**	**Plot 14**	**Plot 15**	**Plot 16**	**Plot 17**	**Plot 18**	**Plot 19**	**Plot 20**	**Plot 21**	**Plot 22**	**Plot 23**	**Plot 24**	**Plot 25**	**Plot 26**
		Native Plant Species (NPS)		12	32	12	18	8	39	5	28	12	6	4	21	36	35
		No. Native Ground Cover		12	29	12	17	8	30	5	24	11	6	4	17	17	17
		No. Groundcover weeds		9	6	9	8	8	1	9	3	11	12	5	5	5	5
		% Weed in groundcover		75%	21%	75%	47%	100%	3%	180%	13%	100%	200%	125%	29%	29%	29%

APPENDIX 5: FAUNA RESULTS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

Aves	Aves	Amphibia	Amphibia	Amphibia	Amphibia	Amphibia	Amphibia	Amphibia	Amphibia	Amphibia	**Family**
Acanthizidae	Acanthizidae	Myobatrachidae	Myobatrachidae	Myobatrachidae	Myobatrachidae	Myobatrachidae	Myobatrachidae	Hylidae	Hylidae	Hylidae	**Class**
Acanthiza chrysorrhoa	Acanthiza apicalis	Pseudophryne bibronii	Neobatrachus sudelli	Limnodynastes tasmaniensis	Limnodynastes peroni	Crinia signifera	Crinia parinsignifera	Litoria rubella	Litoria latopalmata	Litoria caerulea	**Scientific Name**
Yellow-rumped Thornbill	Inland Thornbill	Bibron's Toadlet	Sudell's Frog	Spotted Grass Frog	Striped Marsh Frog	Common Eastern Froglet	Eastern Sign-bearing Froglet	Desert Tree Frog	Broad-palmed Frog	Green Tree Frog	**Common Name**
											Legal Status
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
×											**Bird 1**
											Bird 2
											Bird 3
×											**Bird 4**
×											**Bird 5**
											Bird 6
											Bird 7
											Bird 8
											Bird 9
											Bird 10
											Bird 11
×											**Bird 12**
											Bird 13
											Bird 14
×	×										**Bird 15**
											Bird 16
				×	×	×		×			**Nocturnal Herp 1**
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
								×	×		**Spotlight Transect 4**
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
				×		×		×			**Herp 1**
						×		×			**Herp 2**
				×	×	×					**Herp 3**
				×			×	×	×		**Herp 4**
							×	×	×		**Herp 5**
											Herp 6
											Herp 7
											Herp 8
											Herp 9
					×	×		×			**Herp 10**
											Herp 11
								×			**Herp 12**
					×	×		×			**Herp 13**
		×			×	×		×			**Herp 14**
					×						**Herp 15**
						×					**Herp 16**
						×		×			**Herp 17**
						×					**Herp 18**
					×	×					**Herp 19**
					×			×			**Herp 20**

Family	Class	Scientific Name	Common Name	Legal Status	Incidental (all)	Bird 1	Bird 2	Bird 3	Bird 4	Bird 5	Bird 6	Bird 7	Bird 8	Bird 9	Bird 10	Bird 11	Bird 12	Bird 13	Bird 14	Bird 15	Bird 16	Nocturnal Herp 1	Nocturnal Herp 2	Playback 1	Playback 2	Playback 3	Playback 4	Spotlight Transect 1	Spotlight Transect 2	Spotlight Transect 3	Spotlight Transect 4	Spotlight Point 5	Spotlight Point 6	Spotlight Point 7	Spotlight Point 8	Spotlight transect 9a	Spotlight transect 9b	Herp 1	Herp 2	Herp 3	Herp 4	Herp 5	Herp 6	Herp 7	Herp 8	Herp 9	Herp 10	Herp 11	Herp 12	Herp 13	Herp 14	Herp 15	Herp 16	Herp 17	Herp 18	Herp 19	Herp 20
Aves	Acanthizidae	Acanthiza lineata	Striated Thornbill		x															x																																					
Aves	Acanthizidae	Acanthiza nana	Yellow Thornbill		x												x			x																																					
Aves	Acanthizidae	Acanthiza reguloides	Buff-rumped Thornbill		x				x																																																
Aves	Acanthizidae	Aphelocephala leucopsis	Southern Whiteface		x																																																				
Aves	Acanthizidae	Chthonicola sagittata	Speckled Warbler	V TSC Act	x									1																																											
Aves	Acanthizidae	Gerygone albogularis	White-throated Gerygone		x				x								x			x																																					
Aves	Acanthizidae	Gerygone fusca	Western Gerygone		x																																																				
Aves	Acanthizidae	Smicrornis brevirostris	Weebill		x															x																																					
Aves	Accipitridae	Aquila audax	Wedge-tailed Eagle		x				x																																																
Aves	Accipitridae	Elanus axillaris	Black-shouldered Kite		x											x		x																																							
Aves	Accipitridae	Haliastur sphenurus	Whistling Kite		x																																																				

Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	**Family**
Ardeidae	Ardeidae	Ardeidae	Anhingidae	Anatidae	Anatidae	Anatidae	Alcedinidae	Alcedinidae	Acrocephalidae	Accipitridae	**Class**
Ardea/Egretta sp.	Ardea pacifica	Ardea modesta	Anhinga novaehollandiae	Cygnus atratus	Chenonetta jubata	Anas superciliosa	Todiramphus sanctus	Dacelo novaeguineae	Acrocephalus australis	*Hieraaetus morphnoides*	**Scientific Name**
Unidentified Egret	White-necked Heron	Eastern Great Egret	Australasian Darter	Black Swan	Australian Wood Duck	Pacific Black Duck	Sacred Kingfisher	Laughing Kookaburra	Australian Reed-Warbler	Little Eagle	**Common Name**
		Migratory EPBC Act								V TSC Act	**Legal Status**
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
											Bird 6
											Bird 7
											Bird 8
											Bird 9
											Bird 10
											Bird 11
								×			**Bird 12**
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Family	Class	Scientific Name	Common Name	Legal Status	Incidental (all)	Bird 1	Bird 2	Bird 3	Bird 4	Bird 5	Bird 6	Bird 7	Bird 8	Bird 9	Bird 10	Bird 11	Bird 12	Bird 13	Bird 14	Bird 15	Bird 16	Nocturnal Herp 1	Nocturnal Herp 2	Playback 1	Playback 2	Playback 3	Playback 4	Spotlight Transect 1	Spotlight Transect 2	Spotlight Transect 3	Spotlight Transect 4	Spotlight Point 5	Spotlight Point 6	Spotlight Point 7	Spotlight Point 8	Spotlight transect 9a	Spotlight transect 9b	Herp 1	Herp 2	Herp 3	Herp 4	Herp 5	Herp 6	Herp 7	Herp 8	Herp 9	Herp 10	Herp 11	Herp 12	Herp 13	Herp 14	Herp 15	Herp 16	Herp 17	Herp 18	Herp 19	Herp 20
Aves	Ardeidae	Egretta novaehollandiae	White-faced Heron		x																																																				
Aves	Artamidae	Artamus cyanopterus	Dusky Woodswallow		x			x						x																																											
Aves	Artamidae	Artamus leucorynchus	White-breasted Woodswallow		x									x																																											
Aves	Artamidae	Artamus personatus	Masked Woodswallow		x																																																				
Aves	Artamidae	Artamus superciliosus	White-browed Woodswallow		x			x												x																																					
Aves	Artamidae	Cracticus nigrogularis	Pied Butcherbird		x												x																																								
Aves	Artamidae	Cracticus tibicen	Australian Magpie		x		x		x		x					x	x	x	x	x	x																																				
Aves	Artamidae	Cracticus torquatus	Grey Butcherbird		x				x		x																																														
Aves	Artamidae	Strepera graculina	Pied Currawong		x																																																				
Aves	Cacatuidae	Cacatua sanguinea	Little Corella.		x											x																																									
Aves	Cacatuidae	Calyptorhynchus lathami	Glossy Black-Cockatoo	V TSC Act	x								5																																												

Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	**Family**
Climacteridae	Climacteridae	Cisticolidae	Charadriidae	Charadriidae	Casuariidae	Campephagidae	Campephagidae	Cacatuidae	Cacatuidae	Cacatuidae	**Class**
Cormobates leucophaea	Climacteris picumnus victoriae	Golden-headed Cisticola	Vanellus miles	Elseyornis melanops	Dromaius novaehollandiae	Coracina papuensis	Coracina novaehollandiae	Nymphicus hollandicus	Eolophus roseicapillus	Cacatua galerita	**Scientific Name**
White-throated Treecreeper	Brown Treecreeper (eastern subspecies)	Cisticola exilis	Masked Lapwing	Black-fronted Dotterel	Emu	White-bellied Cuckoo-shrike	Black-faced Cuckoo-shrike	Cockatiel	Galah	Sulphur-crested Cockatoo	**Common Name**
	V TSC Act										**Legal Status**
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
	2								×		**Bird 1**
							×				**Bird 2**
											Bird 3
									×		**Bird 4**
	2										**Bird 5**
											Bird 6
×											**Bird 7**
							×				**Bird 8**
											Bird 9
											Bird 10
										×	**Bird 11**
											Bird 12
											Bird 13
											Bird 14
×											**Bird 15**
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Family	Class	Scientific Name	Common Name	Legal Status	Incidental (all)	Bird 1	Bird 2	Bird 3	Bird 4	Bird 5	Bird 6	Bird 7	Bird 8	Bird 9	Bird 10	Bird 11	Bird 12	Bird 13	Bird 14	Bird 15	Bird 16	Nocturnal Herp 1	Nocturnal Herp 2	Playback 1	Playback 2	Playback 3	Playback 4	Spotlight Transect 1	Spotlight Transect 2	Spotlight Transect 3	Spotlight Transect 4	Spotlight Point 5	Spotlight Point 6	Spotlight Point 7	Spotlight Point 8	Spotlight transect 9a	Spotlight transect 9b	Herp 1	Herp 2	Herp 3	Herp 4	Herp 5	Herp 6	Herp 7	Herp 8	Herp 9	Herp 10	Herp 11	Herp 12	Herp 13	Herp 14	Herp 15	Herp 16	Herp 17	Herp 18	Herp 19	Herp 20
Aves	Columbidae	Geopelia striata	Peaceful Dove		x																																																				
Aves	Columbidae	Ocyphaps lophotes	Crested Pigeon		x																																																				
Aves	Columbidae	Phaps chalcoptera	Common Bronzewing		x																																																				
Aves	Corcoracidae	Corcorax melanorhamphos	White-winged Chough		x	x																																																			
Aves	Corcoracidae	Struthidea cinerea	Apostlebird		x						x																																														
Aves	Corvidae	Corvus coronoides	Australian Raven		x											x		x																																							
Aves	Cuculidae	Cacomantis pallidus	Pallid Cuckoo		x																																																				
Aves	Estrildidae	Stagonopleura guttata	Diamond Firetail	V TSC Act	x					5																																															
Aves	Estrildidae	Taeniopygia bichenovii	Double-barred Finch		x	x	x										x																																								
Aves	Falconidae	Falco berigora	Brown Falcon		x																																																				
Aves	Falconidae	Falco cenchroides	Nankeen Kestrel		x																																																				

Family	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves
Class	Hirundinidae	Hirundinidae	Hirundinidae	Hirundinidae	Maluridae	Meliphagidae	Meliphagidae	Meliphagidae	Meliphagidae	Meliphagidae	Meliphagidae
Scientific Name	Fairy Martin	Hirundo neoxena	Hirundo neoxena	Petrochelidon ariel	Malurus cyaneus	Acanthagenys rufogularis	Anthochaera carunculata	Entomyzon cyanotis	Lichenostomus chrysops	Lichenostomus leucotis
Common Name	Petrochelidon ariel	Welcome Swallow	Welcome Swallow	Fairy Martin	Superb Fairy-wren	Spiny-cheeked Honeyeater	Red Wattlebird	Blue-faced Honeyeater	Yellow-faced Honeyeater	White-eared Honeyeater
Legal Status										
Incidental (all)	×	×	×	×	×	×	×	×	×	×
Bird 1					×					
Bird 2						×			×	
Bird 3					×					
Bird 4						×			×	
Bird 5										
Bird 6						×				
Bird 7					×					
Bird 8										
Bird 9										
Bird 10										
Bird 11										
Bird 12						×				
Bird 13										
Bird 14										
Bird 15										
Bird 16										
Nocturnal Herp 1										
Nocturnal Herp 2										
Playback 1										
Playback 2										
Playback 3										
Playback 4										
Spotlight Transect 1										
Spotlight Transect 2										
Spotlight Transect 3										
Spotlight Transect 4										
Spotlight Point 5										
Spotlight Point 6										
Spotlight Point 7										
Spotlight Point 8										
Spotlight transect 9a										
Spotlight transect 9b										
Herp 1										
Herp 2										
Herp 3										
Herp 4										
Herp 5										
Herp 6										
Herp 7										
Herp 8										
Herp 9										
Herp 10										
Herp 11										
Herp 12										
Herp 13										
Herp 14										
Herp 15										
Herp 16										
Herp 17										
Herp 18										
Herp 19										
Herp 20										

Family	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves
Class	Meliphagidae	Meliphagidae	Meliphagidae	Meliphagidae	Monarchidae	Monarchidae	Motacillidae	Neosittidae	Pachycephalidae		
Scientific Name	Lichenostomus melanops	Lichenostomus penicillatus	Manorina melanocephala	Melithreptus brevirostris	Philemon corniculatus	Plectorhyncha lanceolata	Grallina cyanoleuca	Myiagra inquieta	Anthus novaeseelandiae	Daphoenositta chrysoptera	Colluricincla harmonica
Common Name	Yellow-tufted Honeyeater	White-plumed Honeyeater	Noisy Miner	Brown-headed Honeyeater	Noisy Friarbird	Striped Honeyeater	Magpie-lark	Restless Flycatcher	Australian Pipit	Varied Sittella	Grey Shrike-thrush
Legal Status										V TSC Act	
Incidental (all)	×	×	×	×	×	×	×	×	×	×	×
Bird 1		×									
Bird 2		×			×						×
Bird 3		×									
Bird 4											×
Bird 5											
Bird 6		×									
Bird 7											×
Bird 8											
Bird 9											
Bird 10											
Bird 11			×								
Bird 12											×
Bird 13											
Bird 14											
Bird 15		×									
Bird 16											
Nocturnal Herp 1											
Nocturnal Herp 2											
Playback 1											
Playback 2											
Playback 3											
Playback 4											
Spotlight Transect 1											
Spotlight Transect 2											
Spotlight Transect 3											
Spotlight Transect 4											
Spotlight Point 5											
Spotlight Point 6											
Spotlight Point 7											
Spotlight Point 8											
Spotlight transect 9a											
Spotlight transect 9b											
Herp 1											
Herp 2											
Herp 3											
Herp 4											
Herp 5											
Herp 6											
Herp 7											
Herp 8											
Herp 9											
Herp 10											
Herp 11											
Herp 12											
Herp 13											
Herp 14											
Herp 15											
Herp 16											
Herp 17											
Herp 18											
Herp 19											
Herp 20											

Family	Class	Scientific Name	Common Name	Legal Status	Incidental (all)	Bird 1	Bird 2	Bird 3	Bird 4	Bird 5	Bird 6	Bird 7	Bird 8	Bird 9	Bird 10	Bird 11	Bird 12	Bird 13	Bird 14	Bird 15	Bird 16
Aves	Pachycephalidae	Pachycephala pectoralis	Golden Whistler		x																
Aves	Pachycephalidae	Pachycephala rufiventris	Rufous Whistler		x				x				x			x	x			x	
Aves	Pardalotidae	Pardalotus punctatus	Spotted Pardalote		x							x									
Aves	Pardalotidae	Pardalotus striatus	Striated Pardalote		x							x									
Aves	Passeridae	Passer domesticus	House Sparrow	*	x																
Aves	Pelecanidae	Pelecanus conspicillatus	Australian Pelican		x																
Aves	Petroicidae	Eopsaltria australis	Eastern Yellow Robin		x				x			x									
Aves	Petroicidae	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V TSC Act	x	7			5	10											
Aves	Petroicidae	Microeca fascinans	Jacky Winter		x				x				x							x	x
Aves	Petroicidae	Petroica goodenovii	Red-capped Robin		x								x				x				x
Aves	Petroicidae	Petroica phoenicea	Flame Robin	V TSC Act	x																

Common Name	Nocturnal Herp 1	Nocturnal Herp 2	Playback 1	Playback 2	Playback 3	Playback 4	Spotlight Transect 1	Spotlight Transect 2	Spotlight Transect 3	Spotlight Transect 4	Spotlight Point 5	Spotlight Point 6	Spotlight Point 7	Spotlight Point 8	Spotlight transect 9a	Spotlight transect 9b	Herp 1	Herp 2	Herp 3	Herp 4	Herp 5	Herp 6	Herp 7	Herp 8	Herp 9	Herp 10	Herp 11	Herp 12	Herp 13	Herp 14	Herp 15	Herp 16	Herp 17	Herp 18	Herp 19	Herp 20
Golden Whistler																																				
Rufous Whistler																																				
Spotted Pardalote																																				
Striated Pardalote																																				
House Sparrow																																				
Australian Pelican																																				
Eastern Yellow Robin																																				
Hooded Robin (south-eastern form)																																				
Jacky Winter																																				
Red-capped Robin																																				
Flame Robin																																				

Family	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves
Class	Phalacrocoracidae	Phalacrocoracidae	Podargidae	Podicipedidae	Podicipedidae	Pomatostomidae	Pomatostomidae	Psittacidae	Psittacidae	Psittacidae	Psittacidae
Scientific Name	Microcarbo melanoleucos	Phalacrocorax sulcirostris	Coturnix ypsilophora	Podargus strigoides	Poliocephalus poliocephalus	Tachybaptus novaehollandiae	Pomatostomus superciliosus	temporalis	Platycercus eximius	Polytelis swainsonii	Psephotus haematonotus
Common Name	Little Pied Cormorant	Little Black Cormorant	Brown Quail	Tawny Frogmouth	Hoary-headed Grebe	Australasian Grebe	White-browed Babbler	Grey-crowned Babbler (eastern subspecies)	Eastern Rosella	Superb Parrot	Red-rumped Parrot
Legal Status								V TSC Act		V TSC Act, V EBC Act	
Incidental (all)	×	×	×	×	×	×	×	×	×	×	×
Bird 1											
Bird 2								5	×		
Bird 3								8			
Bird 4								3			
Bird 5											
Bird 6									×		
Bird 7								4			
Bird 8								3			
Bird 9											
Bird 10											
Bird 11									×		
Bird 12											
Bird 13									×	×	×
Bird 14									×		×
Bird 15											
Bird 16								×			
Nocturnal Herp 1											
Nocturnal Herp 2											
Playback 1											
Playback 2											
Playback 3											
Playback 4											
Spotlight Transect 1											
Spotlight Transect 2											
Spotlight Transect 3				×							
Spotlight Transect 4											
Spotlight Point 5											
Spotlight Point 6											
Spotlight Point 7											
Spotlight Point 8				×							
Spotlight transect 9a				×							
Spotlight transect 9b											
Herp 1											
Herp 2											
Herp 3											
Herp 4											
Herp 5											
Herp 6											
Herp 7											
Herp 8											
Herp 9											
Herp 10											
Herp 11											
Herp 12											
Herp 13											
Herp 14											
Herp 15											
Herp 16											
Herp 17											
Herp 18											
Herp 19											
Herp 20											

Family	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves	Aves
Class	Rallidae	Rallidae	Rhipiduridae	Rhipiduridae	Strigidae	Strigidae	Sturnidae	Threskiornithidae	Threskiornithidae	Threskiornithidae	Timaliidae
Scientific Name	Gallinula tenebrosa	Porphyrio porphyrio	Rhipidura leucophrys	Rhipidura albiscapa	Ninox novaeseelandiae	Ninox connivens	Sturnus vulgaris	Platalea flavipes	Threskiornis molucca	Threskiornis spinicollis	Zosterops lateralis
Common Name	Dusky Moorhen	Purple Swamphen	Willie Wagtail	Grey Fantail	Southern Boobook	Barking Owl	Common Starling	Yellow-billed Spoonbill	Australian White Ibis	Straw-necked Ibis	Silvereye
Legal Status						V TSC Act					
Incidental (all)	×	×	×	×	×	×	×	×	×	×	×
Bird 1			×	×							
Bird 2			×	×							
Bird 3											
Bird 4			×	×							
Bird 5				×							
Bird 6			×								
Bird 7				×							
Bird 8											
Bird 9											
Bird 10											
Bird 11											
Bird 12											
Bird 13											
Bird 14											
Bird 15											
Bird 16											
Nocturnal Herp 1											
Nocturnal Herp 2											
Playback 1											
Playback 2											
Playback 3											
Playback 4											
Spotlight Transect 1											
Spotlight Transect 2											
Spotlight Transect 3					×	1					
Spotlight Transect 4											
Spotlight Point 5											
Spotlight Point 6											
Spotlight Point 7											
Spotlight Point 8											
Spotlight transect 9a											
Spotlight transect 9b											
Herp 1											
Herp 2											
Herp 3											
Herp 4											
Herp 5											
Herp 6											
Herp 7											
Herp 8											
Herp 9											
Herp 10											
Herp 11											
Herp 12											
Herp 13											
Herp 14											
Herp 15											
Herp 16											
Herp 17											
Herp 18											
Herp 19											
Herp 20											

Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Aves	Aves	Aves	Aves	Aves	**Family**
Leporidae	Leporidae	Felidae	Emballonuridae	Canidae	Bovidae		Turnicidae	Turnicidae	Turnicidae	Turdidae	**Class**
	Oryctolagus cuniculus	Felis catus	Saccolaimus flaviventris	Vulpes vulpes	Capra hircus	Phaps elegans	Turnix velox	Turnix varia	Coturnix pectoralis	Eurasian Blackbird	**Scientific Name**
Hare	Rabbit	Cat	Yellow-bellied Sheathtail-bat	Fox	Goat	Bush Bronzewing	Little Button-quail	Painted Button-quail	Stubble Quail	Turdus merula	**Common Name**
*	*	*	V TSC Act	*	*					*	**Legal Status**
×	×	×	×	Scats	Scats	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
						×					**Bird 6**
											Bird 7
									×		**Bird 8**
											Bird 9
											Bird 10
											Bird 11
											Bird 12
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
		×		×							**Spotlight transect 9a**
				×							**Spotlight transect 9b**
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	**Family**
Petauridae	Molossidae	Molossidae	Molossidae	Marsupials	Macropodidae	Macropodidae	Macropodidae	Macropodidae	Macropodidae	Macropodidae	**Class**
Petaurus breviceps	Mormopterus planiceps	"Species 4" (big	Austronomus australis	Sminthopsis murina	Wallabia	Wallabia bicolor	Macropus rufogriseus	Macropus robustus	Macropus giganteus	Macropus bernardus	**Scientific Name**
Sugar Glider	Southern Freetail-bat		White-striped Freetail Bat	Murine Dunnart	Wallaroo (Light Morph)	Swamp Wallaby	Red-necked Wallaby	Common Wallaroo	Eastern Grey Kangaroo	Wallaroo (Dark Morph)	**Common Name**
											Legal Status
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
											Bird 6
											Bird 7
											Bird 8
					×					×	**Bird 9**
											Bird 10
											Bird 11
											Bird 12
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
							×		×		**Playback 1**
											Playback 2
									×		**Playback 3**
							×				**Playback 4**
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
×						×			×	×	**Spotlight Transect 4**
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	**Family**
Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Tachyglossidae	Suidae	Phalangeridae	**Class**
Nyctophilus gouldi	Nyctophilus geoffroyi	Miniopterus schreibersii	Falsistrellus tasmaniensis	Chalinolobus picatus	Chalinolobus morio	Chalinolobus gouldii	Chalinolobus dwyeri	Tachyglossus aculeatus	Sus scrofa	Trichosurus vulpecula	**Scientific Name**
Gould's Long-eared Bat	Lesser Long-eared Bat	Common Bentwing-bat	Eastern Falsistrelle	Little Pied Bat	Chocolate Wattled Bat	Gould's Wattled Bat	Large-eared Pied Bat	Short-beaked Echidna	Pig	Common Brushtail Possum	**Common Name**
		V TSC Act V EPBC Act	V TSC Act	V TSC Act			V TSC Act V EPBC Act				**Legal Status**
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
											Bird 6
											Bird 7
											Bird 8
											Bird 9
											Bird 10
											Bird 11
											Bird 12
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
										×	**Spotlight Transect 2**
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
										×	**Spotlight transect 9a**
										×	**Spotlight transect 9b**
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Reptilia	Reptilia	Reptilia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	Mammalia	**Family**
Agamidae	Agamidae	Typhlopidae	Vombatidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	Vespertilionidae	**Class**
Pogona barbata	Amphibolurus nobbi	Rhamphotyphlops bituberculatus	Vombatus ursinus	Vespadelus vulturnus	Vespadelus darlingtoni	Scotorepens greyii	Scotorepens balstoni	Pteropus scapulatus	Nyctophilus timoriensis	Nyctophilus *sp.*	**Scientific Name**
Bearded Dragon	Nobbi	Blind Snake	Common Wombat	Little Forest Bat	Large Forest Bat	Little Broad-nosed Bat	Inland Broad-nosed Bat	Little Red Flying Fox	Greater Long-eared bat	Longeared Bat	**Common Name**
									V TSC Act V EPBC Act		**Legal Status**
×	×	×	Scats	×	×	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
											Bird 6
											Bird 7
											Bird 8
											Bird 9
											Bird 10
											Bird 11
											Bird 12
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
											Herp 1
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
											Herp 7
											Herp 8
											Herp 9
											Herp 10
											Herp 11
											Herp 12
											Herp 13
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	**Family**
Scincidae	Scincidae	Pygopodidea	Gekkonidae	Gekkonidae	Gekkonidae	Gekkonidae	Gekkonidae	Elapidae	Elapidae	Agamidae	**Class**
Ctenotus robustus	Cryptobelpharus carnabyi	Aprasia parapulchella	Strophurus intermedius	Oedura monilis	Gehyra variegata	Diplodactylus vittatus	Diplodactylus Mitheli	Pseudonaja textilis	Pseudechis porphyriacus	Pogona vitticeps	**Scientific Name**
Robust Skink	Snake-eyed Skink	Pink-tailed Worm-lizard	Southern Spiny-tailed Gecko	Ocellated Velvet Gecko	Tree Dtella	Eastern Stone Gecko	Rock Gecko	Eastern Brown Snake	Red-bellied Black Snake	Centralian Bearded Dragon	**Common Name**
		V TSC Act V EPBC Act									**Legal Status**
×	×	×	×	×	×	×	×	×	×	×	**Incidental (all)**
											Bird 1
											Bird 2
											Bird 3
											Bird 4
											Bird 5
											Bird 6
											Bird 7
										×	**Bird 8**
										×	**Bird 9**
											Bird 10
											Bird 11
											Bird 12
											Bird 13
											Bird 14
											Bird 15
											Bird 16
											Nocturnal Herp 1
											Nocturnal Herp 2
											Playback 1
											Playback 2
											Playback 3
											Playback 4
											Spotlight Transect 1
											Spotlight Transect 2
											Spotlight Transect 3
											Spotlight Transect 4
											Spotlight Point 5
											Spotlight Point 6
											Spotlight Point 7
											Spotlight Point 8
											Spotlight transect 9a
											Spotlight transect 9b
				×							**Herp 1**
											Herp 2
											Herp 3
											Herp 4
											Herp 5
											Herp 6
					×						**Herp 7**
											Herp 8
											Herp 9
											Herp 10
×											**Herp 11**
											Herp 12
×				×							**Herp 13**
											Herp 14
											Herp 15
											Herp 16
											Herp 17
											Herp 18
											Herp 19
											Herp 20

	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	Reptilia	**Family**
	Agamidae	Varanidae	Scincidae	Scincidae	Scincidae	Scincidae	Scincidae	Scincidae	Scincidae	**Class**
	Amphibolurus muricatus	Varanus gouldii	Tiliqua scincoides	Morethia boulengeri	Menetia greyi	Lerista muelleri	Lampropholis delicata	Egernia striolata	Ctenotus taeniolatus	**Scientific Name**
	Jacky Lizard	Sand goanna	Eastern Blue-tongue	South-eastern Morethia Skink	Dwarf Skink	Three-toed Skink (Wood Mulch Slider)	Grass Skink	Tree Skink	Copper-tailed Skink	**Common Name**
										Legal Status
185	×	×	×	×	×	×	×	×	×	**Incidental (all)**
10										**Bird 1**
12										**Bird 2**
5										**Bird 3**
17										**Bird 4**
5										**Bird 5**
8										**Bird 6**
8										**Bird 7**
8										**Bird 8**
7										**Bird 9**
0										**Bird 10**
8										**Bird 11**
11										**Bird 12**
6										**Bird 13**
3										**Bird 14**
12										**Bird 15**
4										**Bird 16**
4										**Nocturnal Herp 1**
0										**Nocturnal Herp 2**
2										**Playback 1**
0										**Playback 2**
1										**Playback 3**
1										**Playback 4**
0										**Spotlight Transect 1**
1										**Spotlight Transect 2**
3										**Spotlight Transect 3**
6										**Spotlight Transect 4**
0										**Spotlight Point 5**
0										**Spotlight Point 6**
0										**Spotlight Point 7**
1										**Spotlight Point 8**
4										**Spotlight transect 9a**
2										**Spotlight transect 9b**
4										**Herp 1**
3							×			**Herp 2**
3										**Herp 3**
5	×									**Herp 4**
3										**Herp 5**
1	×									**Herp 6**
2							×			**Herp 7**
0										**Herp 8**
0										**Herp 9**
3										**Herp 10**
2							×			**Herp 11**
1										**Herp 12**
7	×						×			**Herp 13**
4										**Herp 14**
1										**Herp 15**
1										**Herp 16**
2										**Herp 17**
2	×									**Herp 18**
										Herp 19
										Herp 20

This page has been lefty intentionally blank

APPENDIX 6: TRAPPING RESULTS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

DZP trapping Data

TL1	1	2	3	4	5	6	7	8	9	10
Trap Type	G	A	G	G	A	G	G	A	G	G
20.3.2012										
21.3.2012										
22.3.2012				S						
23.3.2012	B		B							
24.3.2012								S		
25.3.2012										

TL2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Trap Type	G	G	A	G	G	A	G	G	A	G	G	A	G	G	A	G	G	G	A	G
20.3.2012		BTL																		
21.3.2012															TS					
22.3.2012							TS													
23.3.2012	BTL			S																
24.3.2012																				
25.3.2012																				

TL3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Trap Type	G	G	A	G	G	G	G	A	G	G	G	G	G	A
21.3.2012									TS					
22.3.2012									TS					
23.3.2012				S										
24.3.2012					S									
25.3.2012														

TL4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Trap Type	G	G	A	A	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
21.3.2012																				
22.3.2012																				
23.3.2012		S																		
24.3.2012																				
25.3.2012																				

TL5	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Trap Type	G	G	A	G	G	A	G	G	A	G	G	A	G	G
21.3.2012														
22.3.2012														
23.3.2012					S	S								
24.3.2012					B									
25.3.2012														

Cage	1	2	3	4	5	6
20.3.2012						
21.3.2012						
23.3.2012		B				
24.3.2012				B		
25.3.2012						
21.10.11						

Trap Type = G (Ground) A (Aboreal)

E/S	Trap Empty and Set
B	Bait Taken
S	Trap Set
BTL	Blue-tongue Lizard
TS	Tree skink

This page has been left intentionally blank

APPENDIX 7: MINIMUM SURVEY EFFORT REQUIRED*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

The Table below summarises the minimum survey effort required for threatened species as per the OEH 'Draft Threatened Biodiversity Survey and Assessment Guidelines for Developments Department of Environment & Climate Change November 2004.'

Minimum survey requirements for threatened fauna species.

Fauna Group	Survey Technique /Method	Survey Period	Minimum Survey Requirements
Amphibians (Frogs)			
Diurnal search	Systematic day habitat search	September - March	• One hour per stratification unit
			• A diurnal survey for basking individuals can be conducted as an additional method for some species. Details of the extra specific methods can be found in the DECC Threatened Species Survey Guidelines: Amphibians.
Nocturnal searches	Night watercourse habitat search	September – March	• Min. two hours per 200m of water body edge over a Min. of two separate nights.
	Night habitat search of damp and watery sites	September - March	• 30 minutes on two separate nights per stratification unit
	Nocturnal call playback	September – March	• Min. 1 hour for minimum two separate nights
	Spotlight searches	September – March	• Min. 30 minutes on two separate nights
Other methods	Driving survey spotlight		• It can be useful for some arboreal species of tree frog during the breeding season when frogs are moving to and from their breeding sites (Lemckert *pers. comm*). It is not suitable for species with small home ranges, or small or sedentary terrestrial species. Only after rain.
	Tadpole survey		• Dip net or by using light traps
	Pitfall Trapping		• Pitfall trapping is generally not recommended for amphibian surveys, but may catch frogs when used as part of a larger survey for reptiles or small mammals.
Reptiles			
Diurnal Search	Systematic day habitat search	November - March	• Min. 30 minute search on two separate days
Nocturnal searches	Pitfall traps with drift nets	November – March	• 24 trap nights (preferably using six (traps for a minimum of four consecutive nights
	Spotlighting	. November - March	• Min. 30 minute search on two separate nights targeting specific habitat
Diurnal Birds			
	Formal census	All year	• 1ha sample habitat plot per 20 minutes

Fauna Group	Survey Technique /Method	Survey Period	Minimum Survey Requirements
	Wetland census	All year All year	• 1 hour census at dawn and dusk for each identified wetland on two separate nights
	Water source census		• A 20 minute census at dawn and dusk for each identified water course on two separate nights
Nocturnal Birds			
	Day habitat search	All year	• Search habitat for pellets and likely tree hollows for Owl species – Min. two separate days
			• Flushing of Bush – Stone Curlews by walking through potential habitat
			• Min. two separate days
			• Observing potential roost hollows for bats
			• Min. 30 minutes prior to sunset and dawn
			• Min. 1 hour following sunrise
	Stag-watching	All year	• Spotlighting for Bush Stone Curlew by foot or from a vehicle driven in 1st gear
	Spotlighting	All year	• Sites should be separated by 800m to 1km and each site must have playback session repeated.
	Call Playback	All year	• At least five visits per site on different nights are required for the Powerful Owl and the Barking Owl. at least six visits per site for the Sooty Owl on different nights and at least eight visits on different nights for the Masked Owl are required. • Note: Powerful Owls and Masked Owls are particularly sensitive to disturbance during the breeding and nesting season and hence, all works during these times should be limited to avoid any potential desertion of nests by the adults. • Sites for the Bush Stone-Curlew should be separated a minimum 2km to 4km apart (i.e. depending on weather conditions and topography) and conducted during the breeding season. Call playback for the Bush Stone-Curlew should consist of playing calls for 30 seconds followed by 4 to 5 minutes of listening. This 5 minute cycle should be repeated up to three times so there is a maximum of 15 minutes survey at each point. The same 30 seconds of calls should be used throughout the survey. Note:

Fauna Group	Survey Technique /Method	Survey Period	Minimum Survey Requirements
			Bush Stone-Curlews are particularly sensitive to human activities when nesting and hence, all works during these times should be limited to avoid abandonment of nests by adult birds.
Mammals			
Small Terrestrial Mammals	Small mammal traps	All year	• 100 trap nights over four consecutive nights per site
	Hair tubes	All year	• 10 small tubes in pairs over 3 to 4 days and 4 nights per site
	Pitfall Traps with drift nets	All year	• 24 trap night nights over 3 to 4 consecutive nights
Medium Terrestrial Mammal	Cage / B Elliot traps	All year	• 100 trap nights over 4 consecutive nights per site
	Hair tubes	All year	• 10 large tubes in pairs over 3 to 4 days and 4 nights per site
Large Terrestrial Mammals	Wire cage traps	All year	• 24 trap nights over 3 to 4 consecutive nights per site
	Large Elliot traps	All year	• 24 trap nights over 3 to 4 consecutive nights
	Sand Plots	All year	• 6 Soil plots for 3 to 4 consecutive nights
Koalas	Daytime habitat search	All year	• Min. 1 day search - walking rate of 1km to 2km per hour – focussed on identifying preferred eucalypt feed trees & habitat through identifying scratch marks on trees and / or scats at base of trees.
	Spotlighting	All year	• Walking rate of 1km per hour - Minimum 2 to 3 consecutive nights
	Call Playback	All year	• Min. two sites per stratification unit up to 200ha plus an additional site per 100ha above 200ha – Min. 2 to 3 consecutive nights
Arboreal Mammals	Arboreal Elliot traps	All year	• 24 trap nights over 3 to 4 consecutive nights per site
	Spotlighting	All year	• Walking rate of 1km per hour per person on 3 to 4 separate nights
	Arboreal Hair Tubes	All year	• 3 hair tubes in each of 10 habitat trees up to 100ha of stratification unit for at least 4 days and 4 nights
	Call Playback (Gliders and Possums)	All year	• 2 sites per stratification unit up to 200ha plus an additional site per 100ha above 200ha. Each playback site must have the session conducted twice on 4 separate nights

Fauna Group	Survey Technique /Method	Survey Period	Minimum Survey Requirements
	Stag-watching	All year	• Observing potential roost hollows for 30 minutes prior to sunset and 1 hour following sunset on two separate nights
Microchiropteran Bats	Harp trapping	October to March	• 2 harp trap nights per broad habitat type for minimum 3 to 4 separate nights
	Echolocation call recording	October to March	• 45 minute continuous recording plus call activated all night for minimum 3 to 4 separate nights
	Mist netting	October to March	• 1 trap set for at least 2 hours duration starting at dusk for minimum two separate nights
	Triplining	October to March	• Targeted survey of water bodies for at least 2 hours duration, starting at dusk for a minimum of two separate nights
	Spotlighting and transect walking	All year	• Targeted survey near likely food resources for at least 2 hours duration for a minimum of two separate nights
	Daytime habitat search	All year	• Search for bat excreta at or near potential habitats
Megachiropteran Bats (Fruit Bats,	Spotlighting	All year	• Walking rate of 1km hour per person on 3 to 4 separate nights
Flying – Foxes)	Mist netting	All year	• 1 trap set for at least 2 hours duration starting at dusk for minimum two separate nights
	Daytime roost site search	All year	• Walking rate of 1km per hour per person

BioBanking Credit Calculator

Threatened species requiring survey

Office of Environment & Heritage

Proposal ID :	127/2012/0398D
Proposal name :	Dubbo Zirconia Project
Assessor name :	Heidi Kolkert
Assessor accreditation number :	127
Tool version :	1.1
Report created :	20/02/2013 10:21

List of species requiring survey

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ausfeld's Wattle	Acacia ausfeldii	N	N	N	N	N	N	N	Y	Y	Y	N	N
Brush-tailed Phascogale	Phascogale tapoatafa	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grey Falcon	Falco hypoleucos	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Little Eagle	Hieraaetus morphnoides	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Narrow Goodenia	Goodenia macbarronii	Y	Y	N	N	N	N	N	N	Y	Y	Y	Y
Pine Donkey Orchid	Diuris tricolor	N	N	N	N	N	N	N	N	Y	Y	Y	N
Rulingia procumbens	Rulingia procumbens	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Silky Swainson-pea	Swainsona sericea	N	N	N	N	N	N	N	N	Y	Y	Y	Y
Sloane's Froglet	Crinia sloanei	N	N	N	N	N	Y	Y	Y	N	N	N	N
Small Purple-pea	Swainsona recta	N	N	N	N	N	N	N	N	Y	Y	Y	N
Square-tailed Kite	Lophoictinia isura	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y

This page has been left intentionally blank

APPENDIX 8: BBAM CREDIT REPORT & SUPPORTING INFORMATION

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

Introduction including description of Proposal including location (CMA, CMA Sub – region and Mitchell Landscape).

Australian Zirconia Ltd (AZL) seeks development consent under Division 4.1 in Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to develop and operate the Dubbo Zirconia Project (the DZP or the Proposal), a small scale open cut mine to supply ore containing rare metals (zirconium and niobium) and rare earth elements (REE's) (including hafnium and tantalum) to a processing plant near the village of Toongi, approximately 25 kilometres south of Dubbo in the Dubbo Local Government Area, NSW (**Figure 1**).

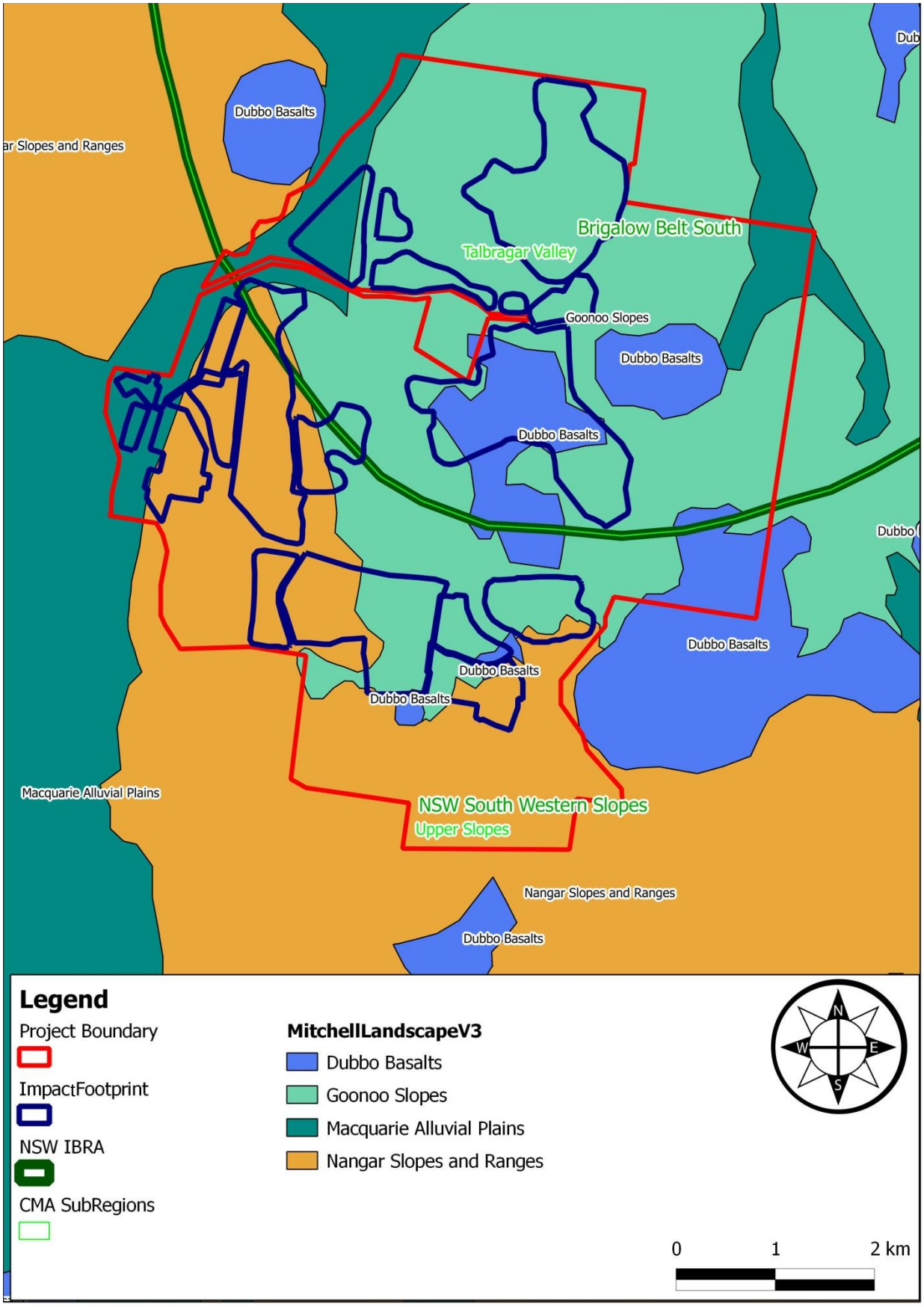
The location of the proposed open cut, processing plant and associated facilities for the management of waste generated by these activities is collectively referred to as the DZP Site. The potential impact of the Proposal on the ecological values of land contained within the DZP Site, as well as land associated with the Dubbo to Toongi section of the Dubbo-Molong Rail Line (in which a proposed gas line would be located), a water pipeline to be constructed between the DZP Site and the Macquarie River and areas on Obley Road requiring upgrades was assessed. Collectively these are referred to as 'The Application Area'.

The DZP Site is:

- 50% within IBRA Brigalow Belt South Bioregion.
- 50% within the IBRA South-western Slopes Bioregion.
- 100% within the Central West CMA.
- 50% in the CW – Upper Slopes CMA subregion
- 50% in CW – Talbragar CMA sub region
- The following Mitchell Landscapes are within the DZP Site
    - Dubbo Basalts (tertiary)
    - Goonoo Slopes (dominant)
    - Macquarie Alluvial Plains (minor)
    - Nangar Slopes and Ranges (subdominant).

See **Figure A**

Figure A: Mitchell Landscapes



Detail proposed methods to be used in surveys.

Methods applied followed BBAM. **Section 4.5** of this report discusses fauna, **Section 4.6** discusses flora. The most important aspect of flora concerns classification of derived grasslands. Grasslands in the DZP Site are used for rotational cropping, when fallow they return to 'grassland'. BBAM was strictly applied, when assessed if it was less than 50% weedy it was considered to be part of a Biometric community and if the community is an EEC it was treated / mapped accordingly. Areas with more than 50% weedy they were mapped as 'Derived Grassland'. In BBAM both areas are managed as CW213 – 'moderate to good quality' where more than 50% native and as 'low quality' when more than 50% weedy. Figures in the report are label 'Derived Grasslands' but do not have CW213 as the prefix to reduce confusion.

BBAM Plot information

PlotName	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Plot 1	15	8	0	80	0	60	24	2	0	64	654158	6411946	55
Plot 2	32	10.5	3.5	78	0	50	4	0	0.33	6	653076	6411302	55
Plot 3	29	43	2.5	28	2	19	2	0	1	10	652842	6411055	55
Plot 4	25	6	70	12	12	32	6	1	1	20	653015	6410863	55
Plot 5	19	13	0.5	90	0	46	8	5	0.5	55	653231	6410675	55
Plot 6	14	0	0	92	4	26	8	1	0	4	653417	6410540	55
Plot 7	13	2	0	60	2	20	70	0	0.33	0	653112	6409915	55
Plot 8	24	19	0	60	0	78	38	1	0.33	36	653552	6410829	55
Plot 9	29	35.5	2	38	0	28	46	1	0.33	30	653459	6410948	55
Plot 10	17	0	0	85	0	10	2	0	0	0	653245	6410510	55
Plot 11	17	10	0	80	2	44	14	9	0	30	652872	6409815	55
Plot 12	11	0	0	100	0	6	0	0	0	0	653577	6410420	55
Plot 13	12	46.5	0	40	0	46	0	0	0	0	653061	6409650	55
Plot 14	32	0	0	95	0	20	4	0	0	0	652792	6409200	55
Plot 15	12	0	0	95	0	20	10	0	0	0	652631	6406797	55
Plot 16	18	4.5	0	65	0	12	6	0	0	14	652316	6406633	55
Plot 17	8	0	0	95	2	6	2	0	0	0	652581	6406919	55
Plot 18	39	37.5	13.5	30	6	16	0	1	2	24	651795	6406523	55
Plot 19	5	0	0	80	0	10	30	1	0	4	653159	6408376	55
Plot 20	28	32	0	50	10	30	2	1	3	45	651647	6410866	55
Plot 21	12	46	0	0	0	5	90	3	0	29	651857	6410696	55
Plot 22	6	0	0	90	0	0	35	0	0	0	653120	6404795	55
Plot 23	4	0	0	100	0	0	6	0	0	0	652115	6405135	55
Plot 24	21	50	0	80	0	30	10	2	0	19	651584	6404650	55
Plot 25	36	25	5	85	3	40	20	7	1	15	650271	6424846	55
Plot 26	35	35	30	90	0	35	25	6	1	30	649582	6423635	55
Any discrepancy with the plot data for each zone (i.e OR) has been upped to the highest number													

NPS = native plant species. NOS = native over-storey cover. NMS = native mid-storey cover. NGCS = native ground cover (grasses). NGCS = native ground cover (shrubs). NGCO = native ground cover (other). EPC = exotic plant cover. NTH = number of trees with hollows. OR = overstorey regeneration. FL = total length of fallen logs.

Remnant patch size calculations were based on existing CMA mapped vegetation and mapped vegetation as part of the project. These were viewed and tallied using GIS. For the majority of grazed /cropped land (CW213 in low condition) the 'Paddock Tree Calculator' was used. As derived vegetation types need to be assessed against the original vegetation type. Basically we took a sample of trees within land in the impact footprint and used GIS to extract the values relevant to the 'Paddock Tree Calculator'. These values were then transferred to the result from the relevant plot.

Management actions were all brought to zero as all vegetation will be cleared. I do understand that this is progressive clearing however essentially it will all be cleared in the impact footprints.

Connectivity was assessed through existing mapping, current mapping and GIS spatial imagery. Majority of vegetation is within 100 m from another remnant (mod-good) to 500 ha + along the road or Dowds hill.

Map illustrating location of circles

- Development Site - See Figures B and C
- Biobank Site See - Figures D, E and F.

Figure B: DEVELOPMENT SITE: DZP Assessed Area

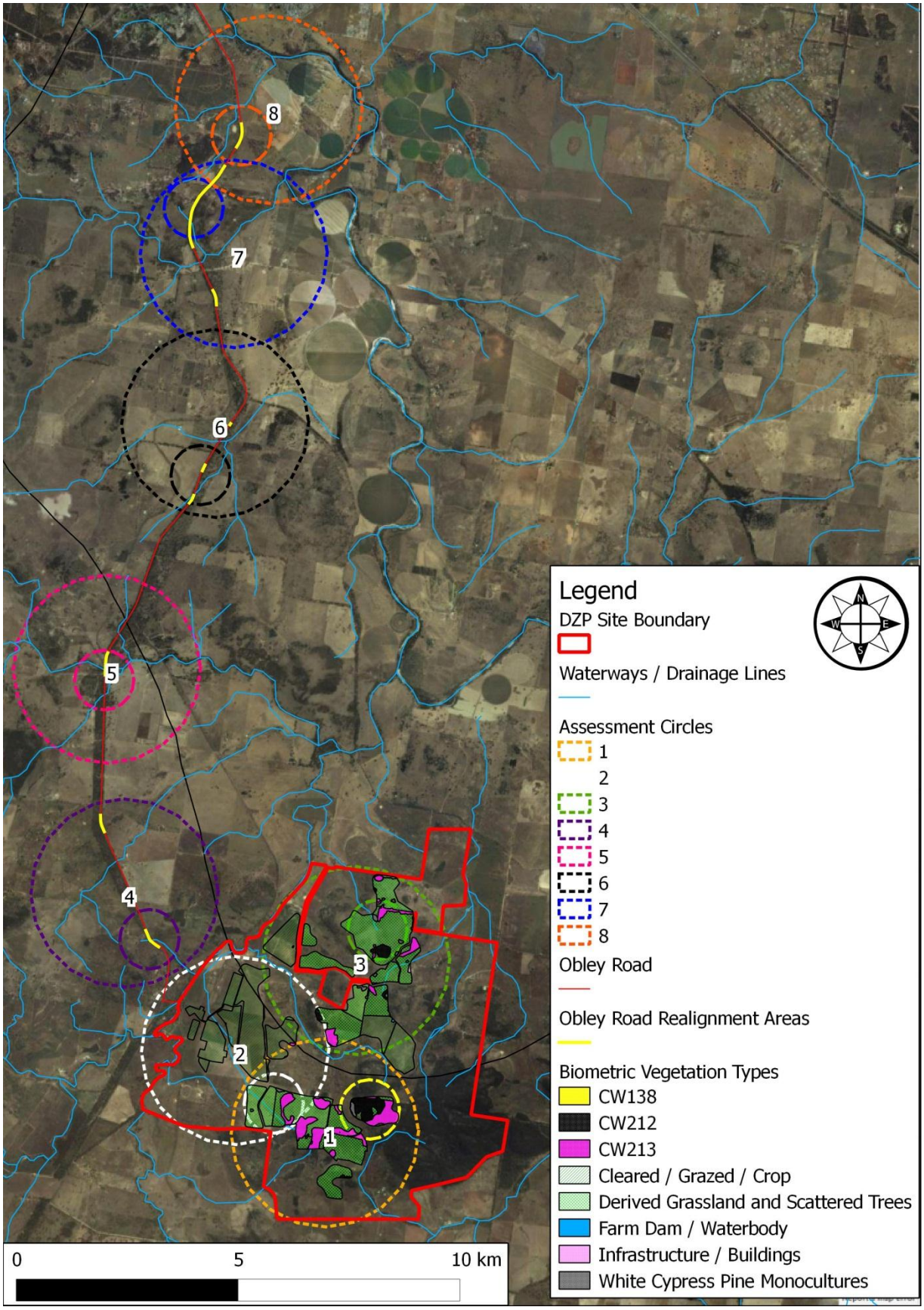
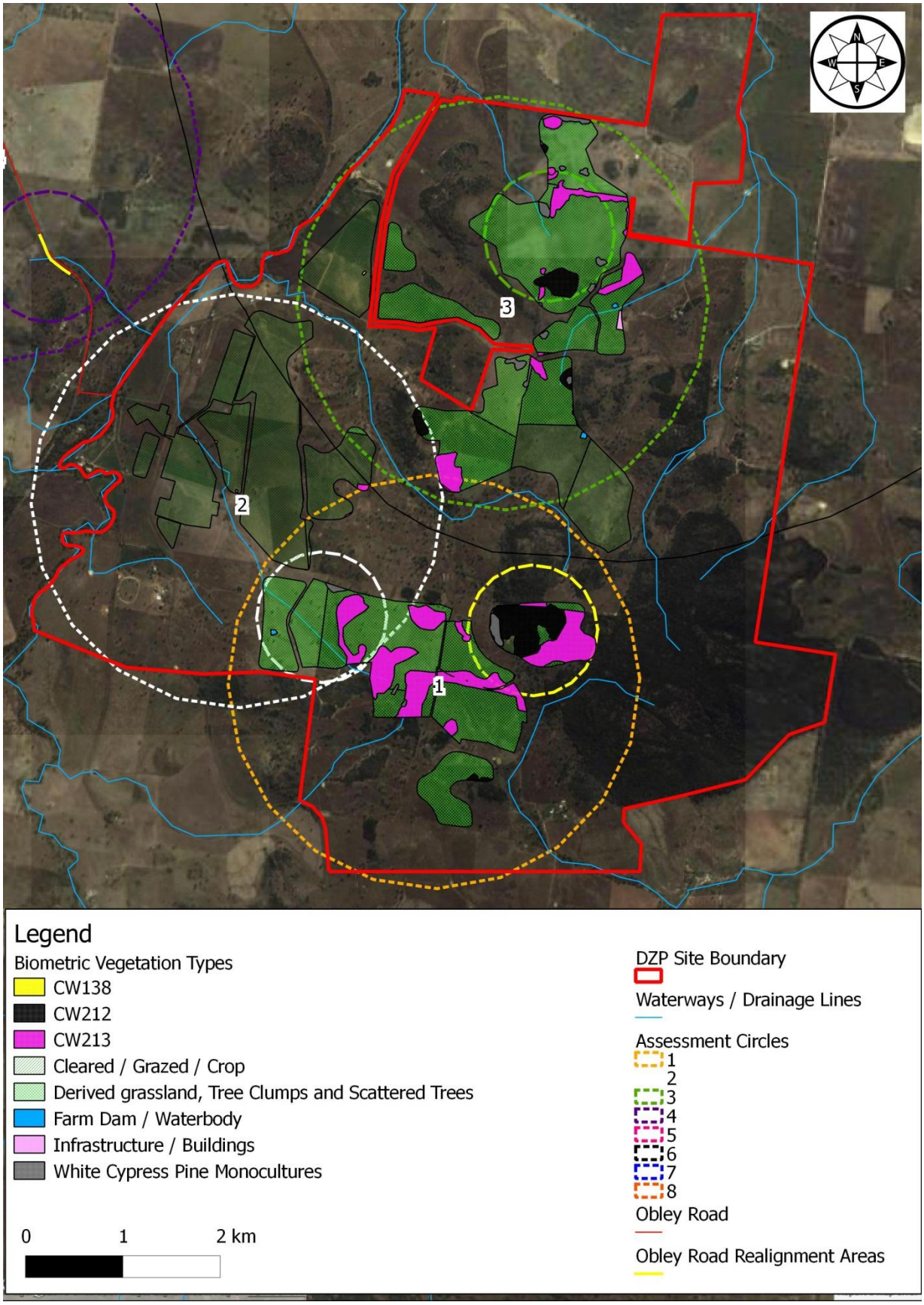


Figure C: DEVELOPMENT SITE: DZP Assessed Area



BIOBANK SITE

Figure D – Circle 1

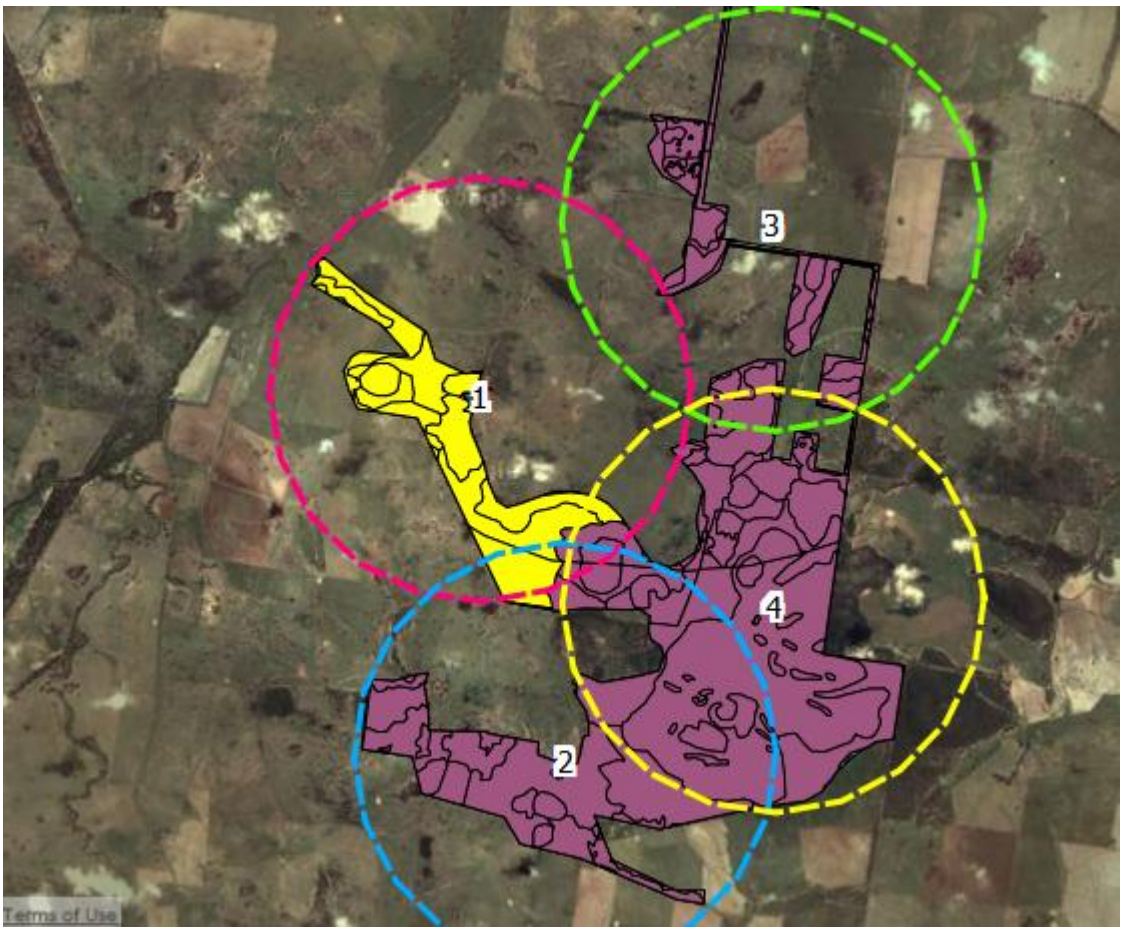


Figure E – Circle 2

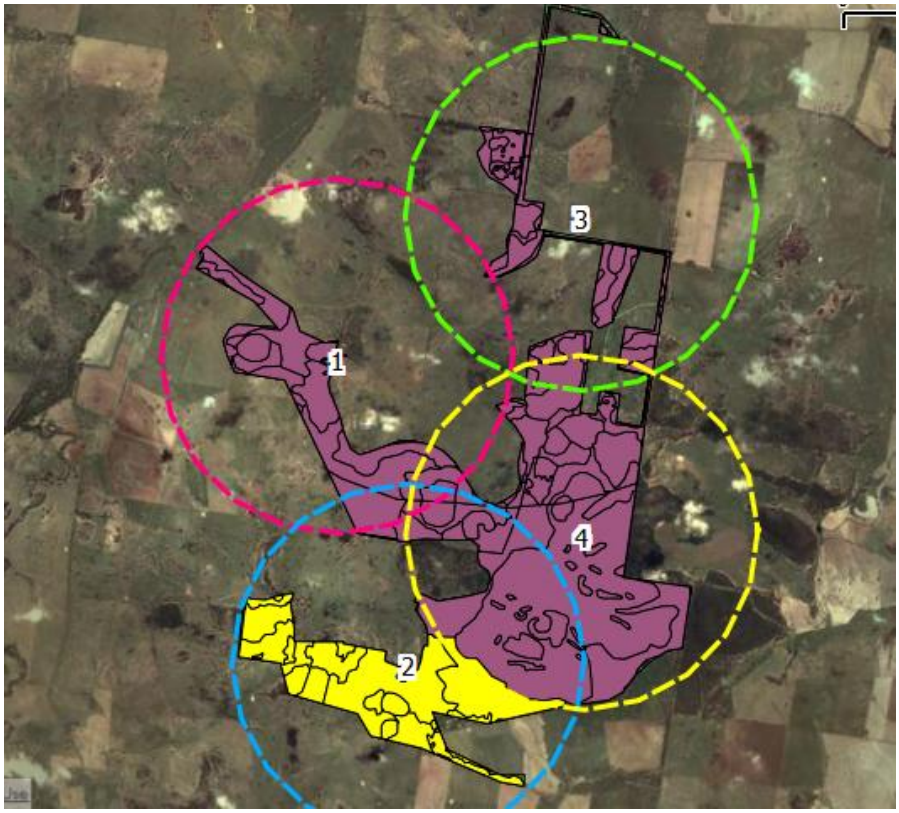


Figure F – Circles 3 and 4

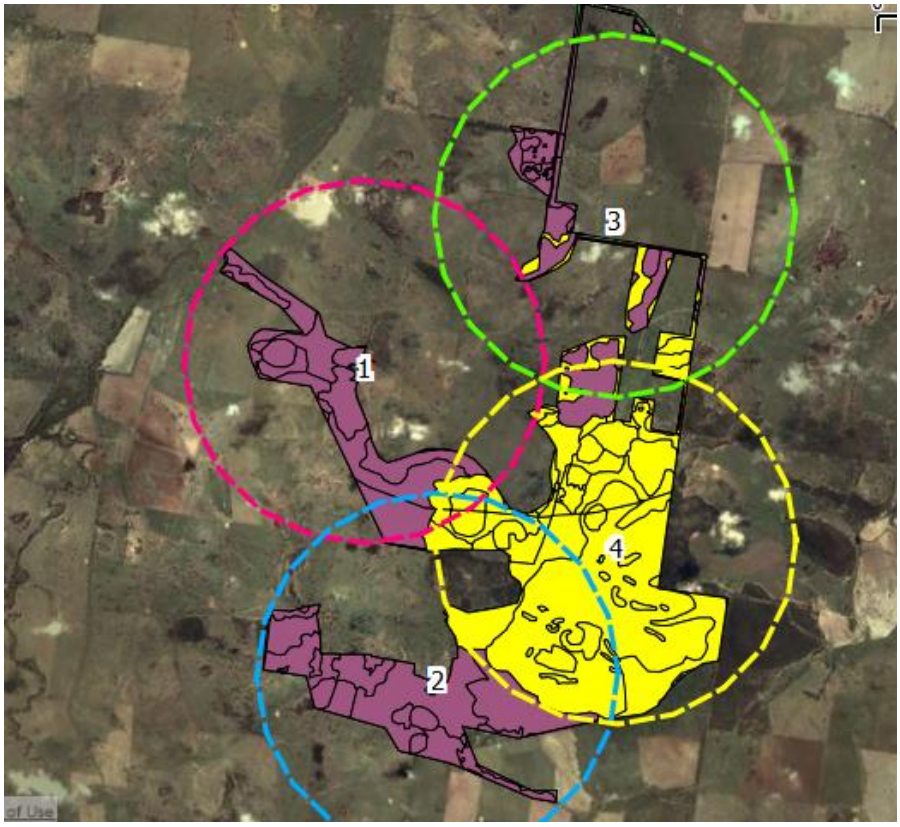


Table detailing vegetation types found on site and biometric equivalents. This should include underlying assumptions for the selection of vegetation types.

See **Section 5.2.1 to 5.2.4 and Figures 17, 18 and 21. Appendix 5** provides flora species recorded at plots assessed (see **Figure 13** for BBAM and Rapid Plot Data locations). As the DZP is divided by two IBRA boundaries OzArk used 'biometric best fit' according to IBRA South-western Slopes for the entire DZP Site because this area is where the largest changes to vegetation would occur.

DZP SITE

Table A: Vegetation in the DZP Site

Veg Type ID	Veg Type Name	% cleared in CMA	Total Area Mapped	Total within DZP Site	Total Disturbed
CW112	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	95% (Red flag, an over cleared veg type, EEC TSC Act, EPBC Act)	127.1	3.2	0.00
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267) - Quality remnants	90% (red flag, EEC TSC Act)	520.5	433.0	43.70
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267) - Derived Grassland (>50% weedy, rotationally cropped).	Not an EEC	674.8	532.4	414.00
CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95% (Red flag and an over cleared veg type, EEC TSC Act)	43.3	23.4	0.10
CW143	Heathy shrublands on rocky outcrops of the western slopes	0.10	25.5	2.6	0.00
CW121	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	95% (Red flag and an over cleared veg type)	3.9	3.9	0.00
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	0.40	539.0	289.0	27.10
N/A	Cleared / Grazed Crop (remainder)	N/A	1208.2	1208.2	313.0
N/A	White Cypress Pine monoculture	N/A	67.9	8.9	9.6
			3211.3	2215.6	807.5

OBLEY ROAD REALIGNMENT

The works at the nine areas requiring treatment would collectively result in disturbance to 1.08 hectares to *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* (CW145).

Table B: Vegetation in the Biodiversity Offset Area

Veg Type ID	Veg Type Name	% cleared in CMA	Total Area Mapped	Total within DZP Assessed Area	Total Disturbed	Total within BOA
CW112	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	95% (Red flag, an over cleared veg type, EEC TSC Act, EPBC Act)	127.10	3.20	0.00	39.20
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90% (red flag, EEC TSC Act)	520.50	433.00	43.70	306.50
CW213	Derived Grassland, Scattered trees and tree clumps (derived from Benson 267)	Not an EEC	674.80	532.40	414.00	306.80
CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95% (Red flag and an over cleared veg type, EEC TSC Act)	43.30	23.40	0.10	21.90
CW143	CW143 Heathy shrublands on rocky outcrops of the western slopes	0.10	25.50	2.60	0.00	25.50
CW121	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	95% (Red flag and an over cleared veg type)	3.90	3.90	0.00	3.90
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	0.40	539.00	289 hectares are within the DZP Site	27.10	256.10
CW145	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	95% (Red flag and an over cleared veg type, EEC TSC Act)	1.08	0.00	1.08	0.00
N/A	Cleared / Grazed Crop (remainder)	N/A	1208.20	1208.20	313.00	53.70
N/A	White Cypress Pine monoculture	N/A	67.90	8.90	9.60	7.40
			3211.28	**2215.60**	**808.58**	**1021.00**

Adequate descriptions of vegetation communities including photos and lists of species observed in each stratum.

See **Section 5.1** (general description and photos) and **Section 5.2** for specific descriptions of mapped communities. **Appendix 4** provided a species list of flora recorded and **Figure 13** shows BBAM and Rapid Plot Data locations.

Map illustrating vegetation zones

See **Figure G.**

Map illustrating threatened species zones

See **Figure H**

Map illustrating management zones

See **Figure I**

Figure G – Vegetation Zones

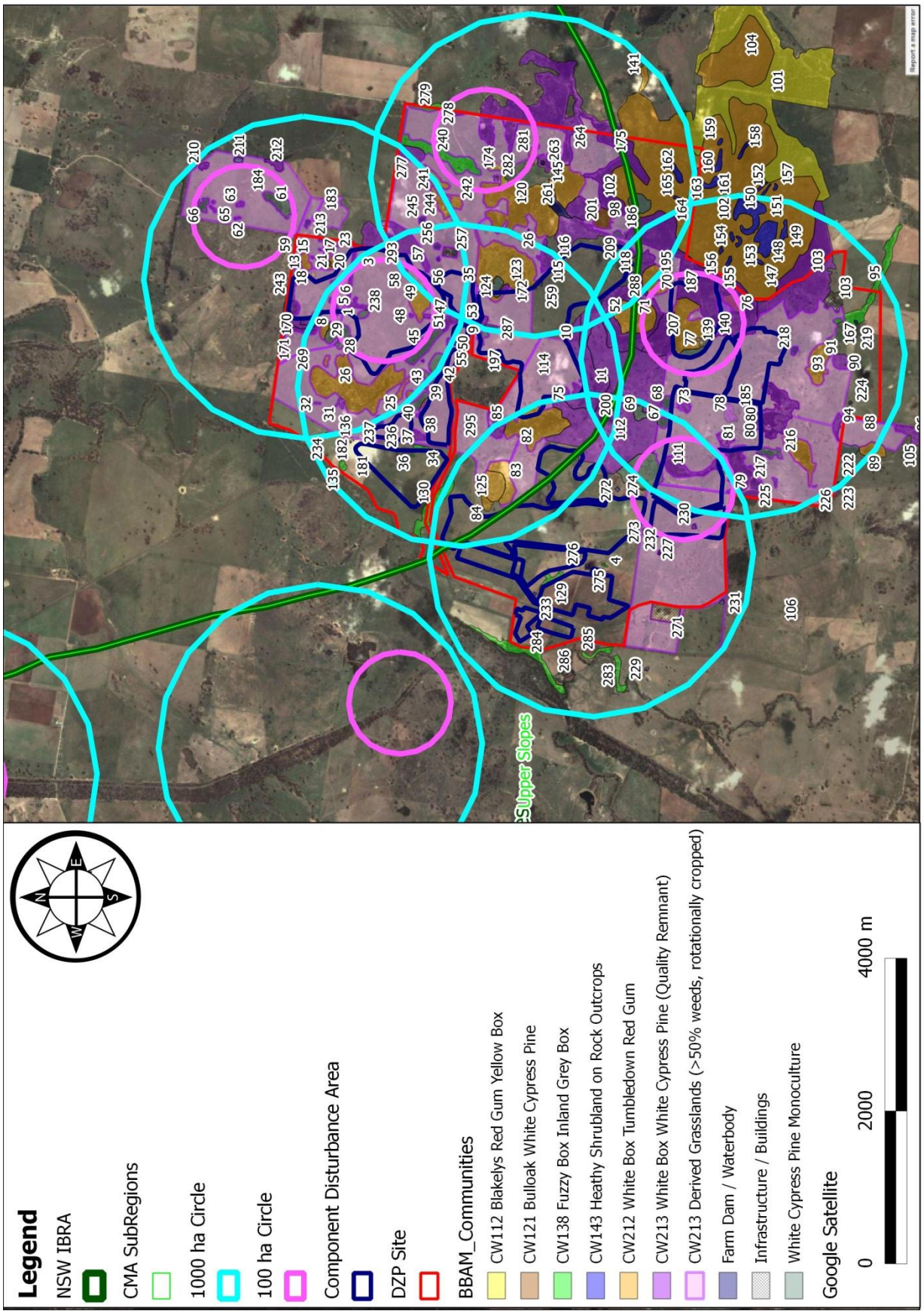


Figure H – Threatened Species Zones

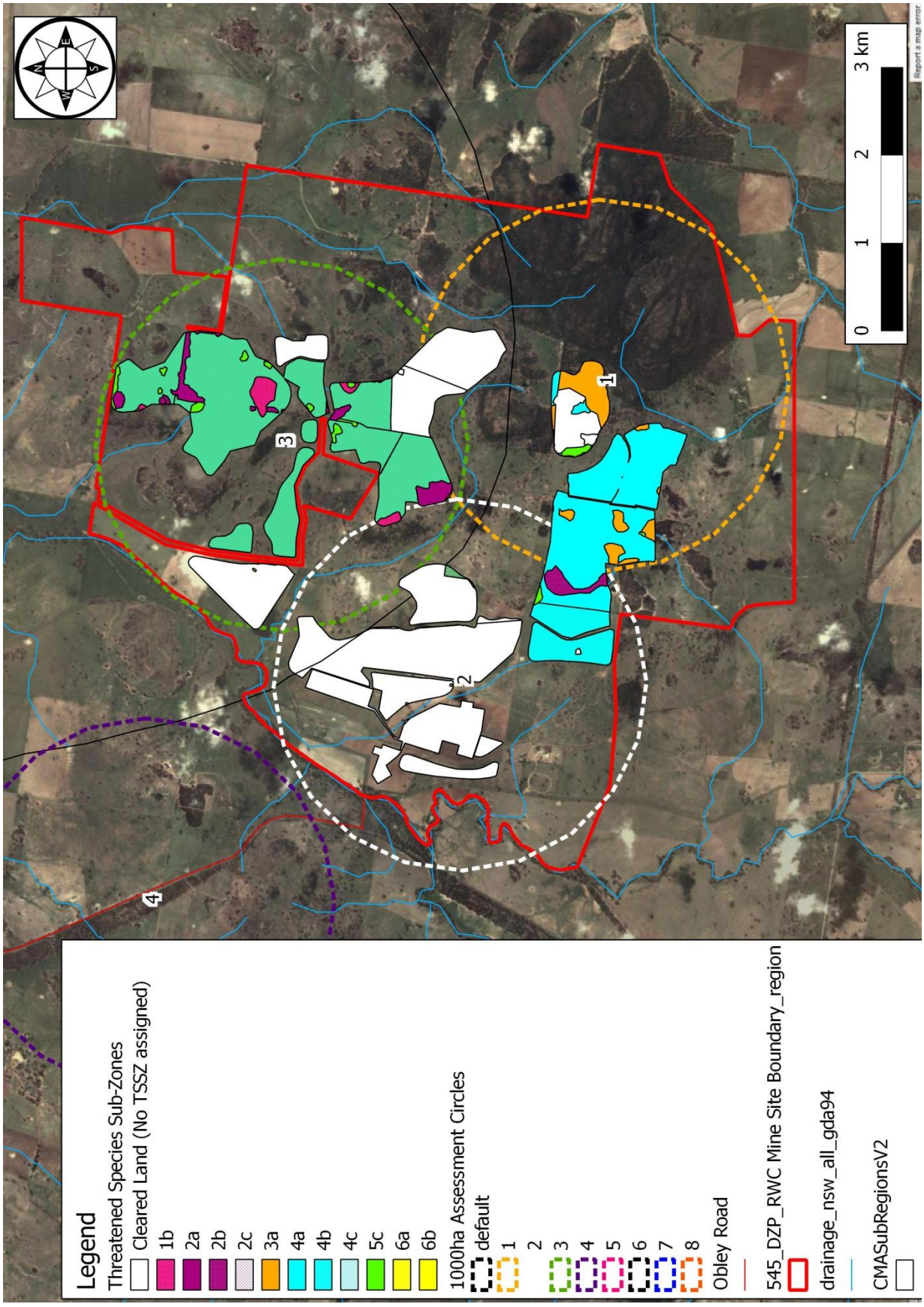
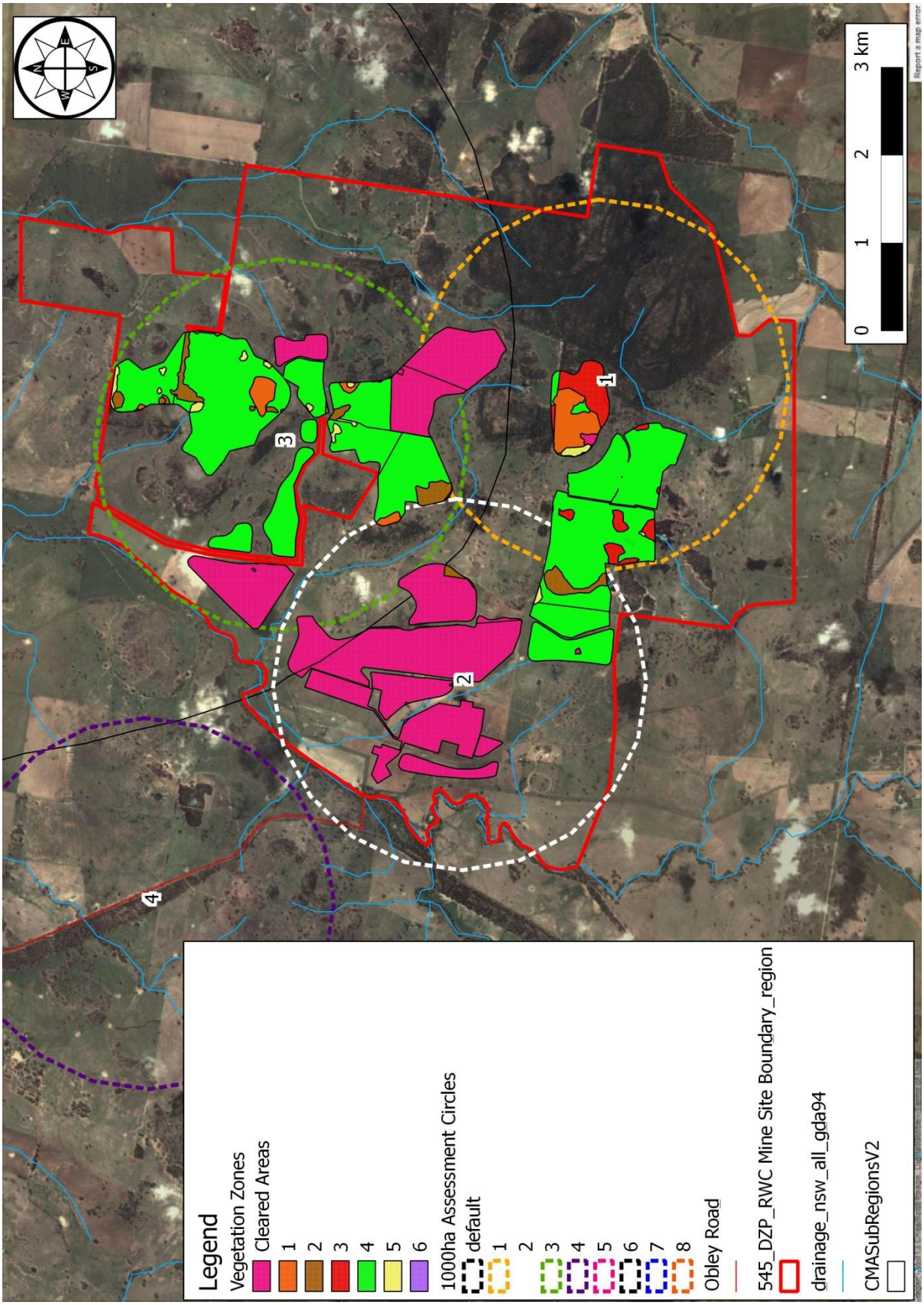


Figure I – Management Zones



DEVELOPMENT SITE: Screen shot of Step 1 in tool showing data entered for 'Landscape values' for each circle.

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circles

Add | Edit | View

ID	Name	CMA subregion	Status	Score
814	1	Upper Slopes - Central West	Complete	22.00
815	2	Upper Slopes - Central West	Complete	19.50
816	3	Talbragar Valley	Complete	21.10
912	4	Upper Slopes - Central West	Complete	12.00
913	5	Upper Slopes - Central West	Complete	12.00
914	6	Talbragar Valley	Complete	12.00
915	7	Talbragar Valley	Complete	12.00
916	8	Talbragar Valley	Complete	12.00

DEVELOPMENT SITE: Screen shot of Step 1 data entry for each threatened species subzone for each landscape circle -including patch size, adjacent remnant area, vegetation type, vegetation condition, area.

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone

Add | Edit | View | Delete

	Veg zone No	Veg type code	Veg type name	Condition	Area (ha)	Status
○	1	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	17.65	Complete
○	1	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	9.39	Complete
○	2	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	8.19	Complete
○	2	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	16.17	Complete
○	3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	25.23	Complete
○	3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.25	Complete
○	3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.26	Complete
○	3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.25	Complete

3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.25	Complete
3	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.82	Complete
4	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	96.21	Complete
4	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	70.39	Complete
4	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	226.34	Complete
5	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	2.44	Complete
5	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	0.74	Complete
5	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	5.75	Complete
6	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Moderate/Good	0.28	Complete
7	CW145	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Moderate/Good_Medium	0.28	Complete
7	CW145	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Moderate/Good_Medium	0.80	Complete

DEVELOPMENT SITE: Screen shot of Step 2 geographic features selections

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment of geographic / habitat features

Does any part of the development impact on the following features? Tick the box wherever the feature is impacted on, or leave blank if no impact will occur.

Impact?	Common name	Scientific name	Feature
☑	Narrow Goodenia	Goodenia macbarronii	seasonally wet/boggy sites (including table drains)
☐	Large-eared Pied Bat (Breeding)	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
☐	Large-eared Pied Bat	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
☐	Brush-tailed Rock-wallaby	Petrogale penicillata	rocky outcops/cliffs in Bathurst CMA subregion
☑	Small Purple-pea	Swainsona recta	land containing a forb-rich grassy groundlayer
☑	Eastern Bentwing-bat (Breeding)	Miniopterus schreibersii oceanensis	land containing caves or similar structures
☐	Zieria obcordata	Zieria obcordata	land containing granite boulders on rocky outcrops.
☑	Sloane's Froglet	Crinia sloanei	Land within 50 meters of identified breeding habitat.
☑	Grey Falcon	Falco hypoleucos	land containing within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses

DEVELOPMENT SITE: Screen shot of Step 4 showing site survey times and species requiring an expert report

Survey time matrix

Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acacia ausfeldii	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No
Crinia sloanei	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No
Diuris tricolor	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Falco hypoleucos	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Goodenia macbarronii	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Grevillea divaricata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hieraaetus morphnoides	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indigofera efoliata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lophoictinia isura	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Miniopterus schreibersii oceanensis	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Phascogale tapoatafa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rulingia procumbens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Swainsona recta	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Swainsona sericea	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Scientific name *	Common name	Tg value	On site *	
Burhinus grallarius	Bush Stone-curlew	0.40	Yes	Edit
Cacatua leadbeateri	Pink Cockatoo	0.53	Yes	Edit
Calyptorhynchus lathami	Glossy Black-cockatoo	0.55	Yes	Edit
Chalinolobus picatus	Little Pied Bat	0.48	Yes	Edit
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	0.50	Yes	Edit
Dasyurus maculatus	Spotted-tailed Quoll	0.35	No	Edit
Glossopsitta pusilla	Little Lorikeet	0.58	Yes	Edit
Grantiella picta	Painted Honeyeater	0.75	Yes	Edit
Lathamus discolor	Swift Parrot	0.75	Yes	Edit
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	0.75	Yes	Edit
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	0.75	Yes	Edit
Neophema pulchella	Turquoise Parrot	0.55	Yes	Edit
Ninox connivens	Barking Owl	0.75	Yes	Edit
Ninox strenua	Powerful Owl	0.75	Yes	Edit
Nyctophilus timoriensis	Greater Long-eared Bat (south eastern form)	0.48	Yes	Edit
Pachycephala inornata	Gilbert's Whistler	0.75	Yes	Edit
Petaurus norfolcensis	Squirrel Glider	0.45	Yes	Edit
Petroica boodang	Scarlet Robin	0.60	Yes	Edit
			Yes	Edit
Petroica phoenicea	Flame Robin	0.60	Yes	Edit
Phascolarctos cinereus	Koala	0.83	No	Edit
Polytelis swainsonii	Superb Parrot	0.53	Yes	Edit
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	0.75	Yes	Edit
Pyrrholaemus saggitatus	Speckled Warbler	0.40	Yes	Edit
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	0.45	Yes	Edit
Stagonopleura guttata	Diamond Firetail	0.75	Yes	Edit
Tyto novaehollandiae	Masked Owl	0.75	Yes	Edit
Xanthomyza phrygia	Regent Honeyeater	0.75	Yes	Edit

DEVELOPMENT SITE: Screen shot showing Step 5a – Red Flag Status of each vegetation type

Page 1 of 2

Vege-tation type	Vegetation type name	Percent cleared in CMA	EEC? *	Red flag?	Area (ha)	Condition	Min. number of Transect / Plots	Transect / Plot complete	Mgmt score complete?	
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	17.65	Moderate/Good	3	6	Yes	Edit
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	9.39	Moderate/Good	3	6	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	8.19	Moderate/Good	3	4	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	16.17	Moderate/Good	3	4	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	25.23	Moderate/Good_Medium	4	5	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.25	Moderate/Good_Medium	1	4	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.26	Moderate/Good_Medium	1	5	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.25	Moderate/Good_Medium	1	5	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.25	Moderate/Good_Medium	1	5	Yes	Edit

	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.82	Moderate/Good_Medium	1	5	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	96.21	Low	3	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	70.39	Low	3	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	226.34	Low	4	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	2.44	Moderate/Good_Other	2	3	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	0.74	Moderate/Good_Other	1	3	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	5.75	Moderate/Good_Other	3	3	Yes	Edit
	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95	not an EEC	Yes	0.28	Moderate/Good	1	3	Yes	Edit
	CW145	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	95	not an EEC	Yes	0.28	Moderate/Good_Medium	1	2	Yes	Edit
	CW145	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	95	not an EEC	Yes	0.80	Moderate/Good_Medium	1	2	Yes	Edit

DEVELOPMENT SITE: Screen shot showing Step 5b - or Table detailing survey results of survey transects/plots.

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW145_Moderate/Good_Medium
Vegetation Type	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	8.0 to 35.0	3.0 to 10.0	13.0 to 50.0	3.0 to 5.0	3.0 to 15.0	See Manual	>=1	1.00	>=75	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 3	29	43.00	2.50	28.00	2.00	19.00	2.00	0	1.00	10.00	652842	6411055	55	Edit	Remove
Plot 25	36	25.00	5.00	85.00	3.00	40.00	20.00	7	1.00	15.00	650271	6424846	55	Edit	Remove

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW145_Moderate/Good_Medium
Vegetation Type	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	8.0 to 35.0	3.0 to 10.0	13.0 to 50.0	3.0 to 5.0	3.0 to 15.0	See Manual	>=1	1.00	>=75	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 3	29	43.00	2.50	28.00	2.00	19.00	2.00	0	1.00	10.00	652842	6411055	55	Edit	Remove
Plot 25	36	25.00	5.00	85.00	3.00	40.00	20.00	7	1.00	15.00	650271	6424846	55	Edit	Remove

DEVELOPMENT SITE: Screen shot showing Step 5c (Management Scores, Management Zone)

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	17.65

Management zone

Site score

ID	Management zone	Area	Status	
6083	MZ1	18.36	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6020	1a	501.00	MZ1	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	9.39

Management zone

Site score

ID	Management zone	Area	Status	
6084	MZ1b	9.39	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6021	1b	501.00	MZ1b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	8.19

Management zone

Site score

ID	Management zone	Area	Status	
6086	MZ2b	7.62	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6022	2b	501.00	MZ2b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	8.19

Management zone

Site score

ID	Management zone	Area	Status	
6086	MZ2b	7.62	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6022	2b	501.00	MZ2b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	16.17

Management zone

Site score

ID	Management zone	Area	Status	
6082	MZ2a	20.83	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6023	2a	501.00	MZ2a	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	25.23

Management zone

Site score

ID	Management zone	Area	Status	
6085	MZ3a	17.70	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6024	3a	501.00	MZ3a	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25

Management zone

Site score

ID	Management zone	Area	Status	
6093	MZ3b	0.25	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6025	3b	501.00	MZ3b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.26

Management zone

Site score

ID	Management zone	Area	Status	
6087	MZ3c	0.26	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6026	3c	501.00	MZ3c	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25

Management zone

Site score

ID	Management zone	Area	Status	
6096	MZ3d	0.25	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6027	3d	501.00	MZ3d	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25

Management zone

Site score

ID	Management zone	Area	Status	
6098	MZ3e	0.25	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6028	3e	501.00	MZ3e	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.82

Management zone

Site score

ID	Management zone	Area	Status	
6088	MZ3f	0.82	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6029	3f	501.00	MZ3f	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	96.21

Management zone

Site score

ID	Management zone	Area	Status	
6089	MZ4a	128.75	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6030	4a	0.00	MZ4a	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	70.39

Management zone

Site score

ID	Management zone	Area	Status	
6091	MZ4b	39.24	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6031	4b	0.00	MZ4b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	226.34

Management zone

Site score

ID	Management zone	Area	Status	
6081	MZ4c	238.57	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6032	4c	0.00	MZ4c	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	2.44

Management zone

Site score

ID	Management zone	Area	Status	
6090	MZ5a	2.43	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6033	5a	0.00	MZ5a	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.74

Management zone

Site score

ID	Management zone	Area	Status	
6092	MZ5b	0.70	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6035	5b	0.00	MZ5b	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.75

Management zone

Site score

ID	Management zone	Area	Status	
6094	MZ5c	5.75	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6036	5c	0.00	MZ5c	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type name	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	0.28

Management zone

Site score

ID	Management zone	Area	Status	
6095	MZ6	0.28	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6037	6a	0.14	MZ6	Edit
6038	6b	0.14	MZ6	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW145_Moderate/Good_Medium
Veg type name	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)
Total veg zone area	0.28

Management zone

Site score

ID	Management zone	Area	Status	
6097	MZ7a	0.28	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6039	7a	501.00	MZ7a	Edit

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW145_Moderate/Good_Medium
Veg type name	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)
Total veg zone area	0.80

Management zone

Site score

ID	Management zone	Area	Status	
6099	MZ7b	0.80	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6040	7b	501.00	MZ7b	Edit

DEVELOPMENT SITE: Screen shot showing Step 5d (Management Scores Site Score) – data entry for management zone score including decrease for additionally or increase in site value for additional management.

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	17.65
Management zone	MZ1
Management zone area	18.36
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	1.00	0.00
Native ground cover (shrubs):	3.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	1.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
58.85	0.00	58.85

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	9.39
Management zone	MZ1b
Management zone area	9.39
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	1.00	0.00
Native ground cover (shrubs):	3.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	1.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
58.85	0.00	58.85

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	8.19
Management zone	MZ2b
Management zone area	7.62
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	1.00	0.00
Native ground cover (grasses):	3.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	2.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
59.38	0.00	59.38

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	8.19
Management zone	MZ2b
Management zone area	7.62
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	1.00	0.00
Native ground cover (grasses):	3.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	2.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
59.38	0.00	59.38

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	16.17
Management zone	MZ2a
Management zone area	20.83
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	1.00	0.00
Native ground cover (grasses):	3.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	2.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
59.38	0.00	59.38

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	25.23
Management zone	MZ3a
Management zone area	17.70
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
70.14	**0.00**	**70.14**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25
Management zone	MZ3b
Management zone area	0.25
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	1.00	0.00
Native ground cover (grasses):	3.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	2.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	**Future Site Value Score (out of 100)**	**Decrease in Site Value Score**
59.38	**0.00**	**59.38**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.26
Management zone	MZ3c
Management zone area	0.26
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
70.14	**0.00**	**70.14**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25
Management zone	MZ3d
Management zone area	0.25
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
70.14	0.00	70.14

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.25
Management zone	MZ3e
Management zone area	0.25
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
70.14	**0.00**	**70.14**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.82
Management zone	MZ3f
Management zone area	0.82
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	2.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
70.14	**0.00**	**70.14**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	96.21
Management zone	MZ4a
Management zone area	128.75
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	1.00	0.00
Native mid-storey cover:	0.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	0.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
39.06	0.00	39.06

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	70.39
Management zone	MZ4b
Management zone area	39.24
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	1.00	0.00
Native mid-storey cover:	0.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	0.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
39.06	0.00	39.06

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	226.34
Management zone	MZ4c
Management zone area	238.57
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	2.00	0.00
Native over-storey cover:	1.00	0.00
Native mid-storey cover:	0.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	1.00	0.00
Native ground cover (other):	2.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	0.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
39.06	0.00	39.06

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	2.44
Management zone	MZ5a
Management zone area	2.43
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	0.00	0.00
Native ground cover (other):	0.00	0.00
Exotic plant cover:	3.00	0.00
Number of trees with hollows:	0.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	0.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
55.73	0.00	55.73

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.74
Management zone	MZ5b
Management zone area	0.70
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	0.00	0.00
Native ground cover (other):	0.00	0.00
Exotic plant cover:	3.00	0.00
Number of trees with hollows:	0.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	0.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
55.73	0.00	55.73

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and s 201)
Total veg zone area	0.28
Management zone	MZ6
Management zone area	0.28
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	3.00	0.00
Native ground cover (shrubs):	3.00	0.00
Native ground cover (other):	3.00	0.00
Exotic plant cover:	3.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	3.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
100.00	0.00	100.00

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.75
Management zone	MZ5c
Management zone area	5.75
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	2.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	0.00	0.00
Native ground cover (other):	0.00	0.00
Exotic plant cover:	3.00	0.00
Number of trees with hollows:	0.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	0.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
55.73	0.00	55.73

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW145_Moderate/Good_Medium
Veg type	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and
Total veg zone area	0.28
Management zone	MZ7a
Management zone area	0.28
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
79.17	**0.00**	**79.17**

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW145_Moderate/Good_Medium
Veg type	Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina
Total veg zone area	0.80
Management zone	MZ7b
Management zone area	0.80
Status	Complete

Management zone attribute score

Enter score with development for each site attribute

	Current score (0-3)	Score with development (0-3)
Native plant species:	3.00	0.00
Native over-storey cover:	3.00	0.00
Native mid-storey cover:	3.00	0.00
Native ground cover (grasses):	2.00	0.00
Native ground cover (shrubs):	2.00	0.00
Native ground cover (other):	1.00	0.00
Exotic plant cover:	2.00	0.00
Number of trees with hollows:	3.00	0.00
Overstorey regeneration:	3.00	0.00
Total length of fallen logs:	1.00	0.00

Current Site Value Score (out of 100)	Future Site Value Score (out of 100)	Decrease in Site Value Score
79.17	**0.00**	**79.17**

DEVELOPMENT SITE: Screen shot or Table showing Step 5f – results of targeted species searches

Assessment details

Assessment details | Proponent details | Landscape value | Vegetation zone | Geographic / habitat feature | Identified population | Site survey details | Site values | Threatened species survey results | Credits

Home

Save | Save & Close | Cancel

* indicates a mandatory item.

Assessment type	Development
Proposal ID	127/2012/0398D
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Threatened species identified

Scientific name *	Common name	Impacted by development?	Id method	Loss	UOM	Survey date	Negl loss	Tg value		
									Add	Clear
Species list										
Diuris tricolor	Pine Donkey Orchid	No	Survey	0.00	indiv	12/10/2012	9999999.00	0.83	Edit	Remove
Goodenia macbarronii	Narrow Goodenia	No	Survey	0.00	indiv	12/10/2012	9999999.00	0.75	Edit	Remove
Grevillea divaricata	Grevillea divaricata	No		0.00	indiv	01/1/1901	0.00	0.13	Edit	Remove

Indigofera efoliata	Leafless Indigo	No		0.00	indiv	01/1/1901	0.00	0.13	Edit	Remove
Rulingia procumbens	Rulingia procumbens	No	Survey	0.00	indiv	12/10/2012	0.00	0.68	Edit	Remove
Swainsona recta	Small Purple-pea	No	Survey	0.00	indiv	12/10/2012	0.00	0.40	Edit	Remove
Swainsona sericea	Silky Swainson-pea	No	Survey	0.00	indiv	12/10/2012	5.00	0.58	Edit	Remove
Aprasia parapulchella	Pink-tailed Worm-lizard	Yes	Survey	45.00	ha	01/2/2012	9999999.00	0.35	Edit	Remove
Falco hypoleucos	Grey Falcon	Yes	Assumed	479.02	ha	21/3/2012	9999999.00	0.74	Edit	Remove
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	No		0.00	ha	01/1/1901	9999999.00	0.75	Edit	Remove
Chalinolobus picatus	Little Pied Bat	Yes	Survey	88.50	ha	21/3/2012	9999999.00	0.48	Edit	Remove
Lophoictinia isura	Square-tailed Kite	Yes	Survey		ha	21/3/2012	9999999.00	0.74	Edit	Remove
Phascogale tapoatafa	Brush-tailed Phascogale	No	Survey	0.00	ha	21/3/2012	0.00	0.50	Edit	Remove
Acacia ausfeldii	Ausfeld's Wattle	No	Survey	0.00	indiv	21/3/2012	5.00	0.13	Edit	Remove
Crinia sloanei	Sloane's Froglet	No	Survey	0.00	ha	21/3/2012	9999999.00	0.75	Edit	Remove
Hieraaetus morphnoides	Little Eagle	Yes	Survey	479.02	ha	21/3/2012	9999999.00	0.74	Edit	Remove

DEVELOPMENT SITE: Copy of credit requirements generated by biobank or/and development site

BioBanking Credit Calculator

Office of Environment & Heritage

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 14/06/2013 Time: 11:24:07AM Tool version: 2.0

Development details

Proposal ID:	127/2012/0398D
Proposal name:	Dubbo Zirconia Project
Proposal address:	Toongi Road, Toongi Dubbo NSW 2380
Proponent name:	Alkane Resources
Proponent address:	PO Box 910 Dubbo NSW 2830
Proponent phone:	02 6882 2866
Assessor name:	Heidi Kolkert
Assessor address:	PO Box 2028 ARIMDALE NSW 2350
Assessor phone:	0418 324 136
Assessor accreditation:	127

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Barking Owl	An impact greater than that allowed;
Flame Robin	An impact greater than that allowed;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

☐ Change to percent cleared for a vegetation type/s

- White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
- White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
- White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

☐ Use of local benchmark

☐ Change negligible loss

☐ Expert report

☐ Predicted threatened species not on site

- Koala — Phascolarctos cinereus
- Spotted-tailed Quoll — Dasyurus maculatus

☐ Change threatened species response to gain (Tg value)

- Barking Owl — Ninox connivens
- Glossy Black-cockatoo — Calyptorhynchus lathami
- Large-eared Pied Bat — Chalinolobus dwyeri
- Masked Owl — Tyto novaehollandiae
- Powerful Owl — Ninox strenua

Ecosystem Credit Summary

Vegetation type	Area (ha)	Credits required	Red flag
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	238.57	3,588	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	20.83	978	Yes
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	18.36	866	No
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	9.39	437	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	7.62	355	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	17.70	917	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.82	40	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.26	13	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.25	12	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.25	12	Yes
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	0.80	37	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	2.43	47	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	39.24	574	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.25	12	Yes
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.70	13	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	128.75	1,965	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	5.75	110	No
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	0.28	13	Yes

Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	0.28	17	Yes
Total	492.53	10,006	

Credit profiles

1. Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)

Number of ecosystem credits required	17
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	0-5 ha

Offset options - vegetation types	Offset options - CMA sub-regions
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)	Talbragar Valley Pilliga - Central West Pilliga (Part A) Upper Slopes - Lachlan Upper Slopes - Central West

2. Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)

Number of ecosystem credits required	37
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)	Talbragar Valley Pilliga - Central West Upper Slopes - Central West

3. Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)

Number of ecosystem credits required	13
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions

Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)	Upper Slopes - Central West Pilliga - Central West

4. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	52
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)	Talbragar Valley MU Fans
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (LA216)	Pilliga - Central West
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (MR643)	Upper Slopes - Central West
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (MU606)	

5. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	3,698
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	

Offset options - vegetation types	Offset options - CMA sub-regions
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (CW102)	Wollemi - Central West Capertee
Black Sallee - Tussock Grass open woodland of the South Eastern Highlands, (CW109)	Bathurst - Central West
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277), (CW112)	Hill End Orange - Central West
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)	Oberon - Central West Kerrabee - Central West
Fuzzy Box on loams in the Nandewar Bioregion and northern Brigalow Belt South Bioregion (Benson 202), (CW139)	Talbragar Valley
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)	Liverpool Range - Central West Pilliga Outwash - Central West
White Box - Rough-barked Apple alluvial woodland on the NSW western slopes (Benson 274), (CW211)	Pilliga - Central West Nymagee-Rankins Springs - Central West
White Box - White Cypress Pine - Inland Grey Box woodland on the	

western slopes of NSW (Benson 267), (CW213) White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions, (CW215) White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266), (CW216) Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276), (CW226)	Upper Slopes - Central West Lower Slopes - Central West Bogan-Macquarie - Central West Canbelego Downs - Central West Castlereagh-Barwon - Central West

6. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	990
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	**Offset options - CMA sub-regions**
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (LA218) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (MR643) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (MU606)	Talbragar Valley MU Fans Pilliga - Central West Upper Slopes - Central West

7. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	587
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	

Offset options - vegetation types	**Offset options - CMA sub-regions**
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (CW102) Black Sallee - Tussock Grass open woodland of the South Eastern Highlands, (CW109) Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277), (CW112) Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138) Fuzzy Box on loams in the Nandewar Bioregion and northern Brigalow Belt South Bioregion (Benson 202), (CW139) Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the	Wollemi - Central West Capertee Bathurst - Central West Hill End Orange - Central West Oberon - Central West Kerrabee - Central West Talbragar Valley Liverpool Range - Central West

NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145) White Box - Rough-barked Apple alluvial woodland on the NSW western slopes (Benson 274), (CW211) White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213) White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions, (CW215) White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266), (CW216) Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276), (CW226)	Pilliga Outwash - Central West Pilliga - Central West Nymagee-Rankins Springs - Central West Upper Slopes - Central West Lower Slopes - Central West Bogan-Macquarie - Central West Canbelego Downs - Central West Castlereagh-Barwon - Central West

8. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	355
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)	Upper Slopes - Central West MU Fans Pilliga - Central West

9. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	25
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)	Upper Slopes - Central West MU Fans Pilliga - Central West

10. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	2,012
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	

Offset options - vegetation types	Offset options - CMA sub-regions
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (CW102)	Wollemi - Central West
Black Sallee - Tussock Grass open woodland of the South Eastern Highlands, (CW109)	Capertee
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277), (CW112)	Bathurst - Central West
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)	Hill End
Fuzzy Box on loams in the Nandewar Bioregion and northern Brigalow Belt South Bioregion (Benson 202), (CW139)	Orange - Central West
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76), (CW145)	Oberon - Central West
White Box - Rough-barked Apple alluvial woodland on the NSW western slopes (Benson 274), (CW211)	Kerrabee - Central West
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)	Talbragar Valley
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions, (CW215)	Liverpool Range - Central West
White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266), (CW216)	Pilliga Outwash - Central West
Yellow Box tall grassy woodland on alluvial flats mainly in the NSW South Western Slopes Bioregion (Benson 276), (CW226)	Pilliga - Central West
	Nymagee-Rankins Springs - Central West
	Upper Slopes - Central West
	Lower Slopes - Central West
	Bogan-Macquarie - Central West
	Canbelego Downs - Central West
	Castlereagh-Barwon - Central West

11. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	917
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)	Upper Slopes - Central West
	MU Fans
	Pilliga - Central West

12. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	437
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)	Upper Slopes - Central West

13. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	866
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)	Upper Slopes - Central West

Species credits

Scientific name	Common name	Red flag	Species Tg value	Final credits
Falco hypoleucos	Grey Falcon	No	0.74	6473
Hieraaetus morphnoides	Little Eagle	No	0.74	6473
Chalinolobus picatus	Little Pied Bat	No	0.48	1844
Aprasia parapulchella	Pink-tailed Worm-lizard	No	0.35	1286
Lophoictinia isura	Square-tailed Kite	No	0.74	6473

BIOBANK SITE: Screen shot of Step 1 in tool showing data entered for 'Landscape values' for each circle.

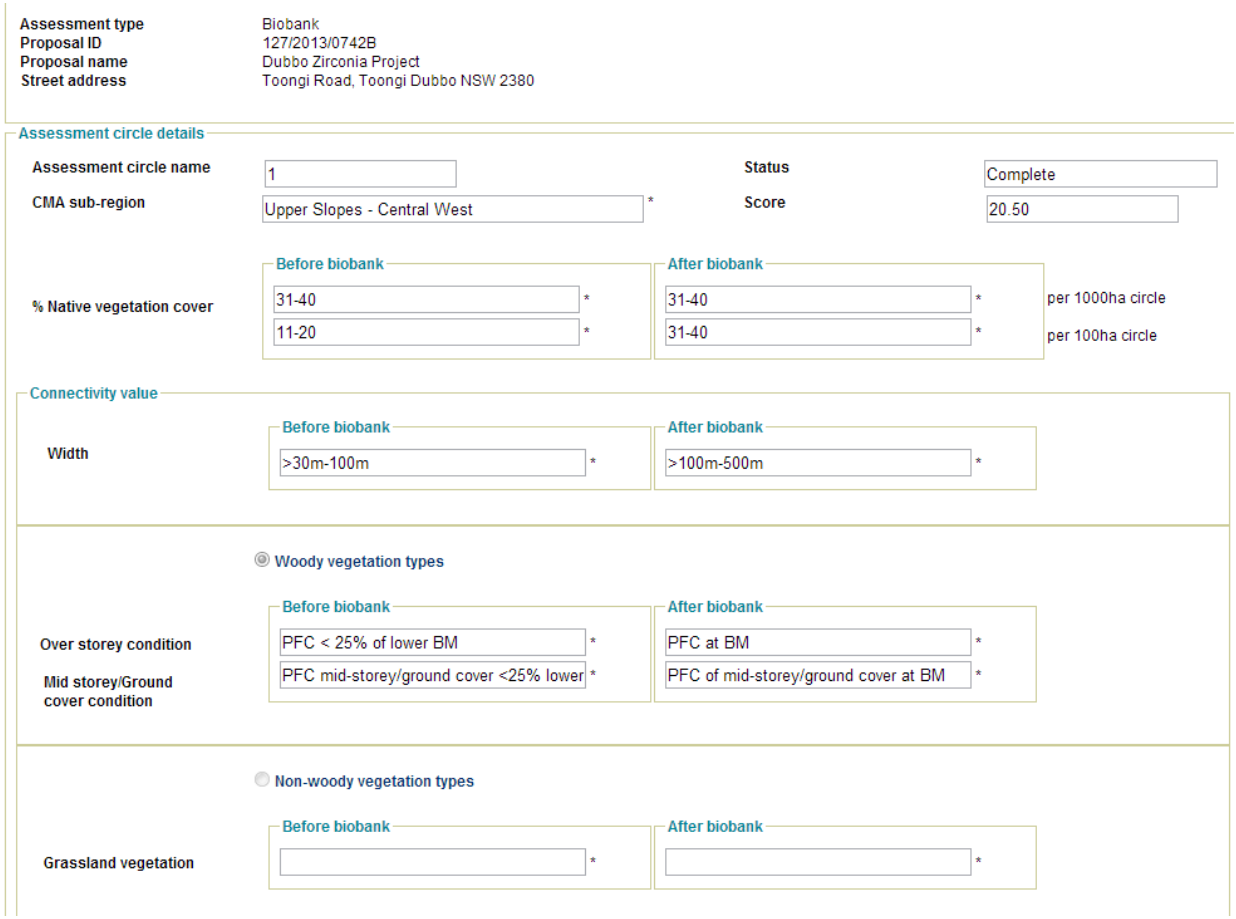
Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circles

Add | Edit | View | Delete

ID	Name	CMA subregion	Status	Score
1332	1	Upper Slopes - Central West	Complete	20.50
1334	2	Talbragar Valley	Complete	22.10
1335	3	Upper Slopes - Central West	Complete	19.40
1336	4	Talbragar Valley	Complete	16.50

BIOBANK SITE: Screen shot of Step 1 data entry for each threatened species subzone for each landscape circle -including patch size, adjacent remnant area, vegetation type, vegetation condition, area.



Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circle details

Assessment circle name	1	**Status**	Complete	
CMA sub-region	Upper Slopes - Central West *	**Score**	20.50	
	Before biobank	**After biobank**		
% Native vegetation cover	31-40 *	31-40 *	per 1000ha circle	
	11-20 *	31-40 *	per 100ha circle	

Connectivity value

	Before biobank	**After biobank**
Width	>30m-100m *	>100m-500m *

Woody vegetation types

	Before biobank	**After biobank**
Over storey condition	PFC < 25% of lower BM *	PFC at BM *
Mid storey/Ground cover condition	PFC mid-storey/ground cover <25% lower *	PFC of mid-storey/ground cover at BM *

Non-woody vegetation types

	Before biobank	**After biobank**
Grassland vegetation	*	*

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circle details

Assessment circle name	2	**Status**	Complete
CMA sub-region	Talbragar Valley *	**Score**	22.10

	Before biobank	After biobank	
% Native vegetation cover	41-50 *	51-60 *	per 1000ha circle
	11-20 *	51-60 *	per 100ha circle

Connectivity value

	Before biobank	After biobank
Width	>30m-100m *	>30m-100m *

Woody vegetation types

	Before biobank	After biobank
Over storey condition	PFC < 25% of lower BM *	PFC at BM *
Mid storey/Ground cover condition	PFC mid-storey/ground cover <25% lower *	PFC of mid-storey/ground cover at BM *

Non-woody vegetation types

	Before biobank	After biobank
Grassland vegetation	*	*

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circle details

Assessment circle name	3	**Status**	Complete
CMA sub-region	Upper Slopes - Central West *	**Score**	19.40

	Before biobank	After biobank	
% Native vegetation cover	11-20 *	21-30 *	per 1000ha circle
	21-30 *	31-40 *	per 100ha circle

Connectivity value

	Before biobank	After biobank
Width	>30m-100m *	>30m-100m *

Woody vegetation types

	Before biobank	After biobank
Over storey condition	PFC < 25% of lower BM *	PFC at BM *
Mid storey/Ground cover condition	PFC mid-storey/ground cover <25% lower *	PFC of mid-storey/ground cover at BM *

Non-woody vegetation types

	Before biobank	After biobank
Grassland vegetation	*	*

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment circle details

Assessment circle name	4	**Status**	Complete
CMA sub-region	Talbragar Valley *	**Score**	16.50

	Before biobank	After biobank	
% Native vegetation cover	71-80 *	71-80 *	per 1000ha circle
	81-90 *	91-100 *	per 100ha circle

Connectivity value

	Before biobank	After biobank
Width	>30m-100m *	>30m-100m *

Woody vegetation types

	Before biobank	After biobank
Over storey condition	PFC < 25% of lower BM *	PFC at BM *
Mid storey/Ground cover condition	PFC mid-storey/ground cover <25% lower *	PFC of mid-storey/ground cover at BM *

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone

Add | Edit | View | Delete

Veg zone No	Veg type code	Veg type name	Condition	Area (ha)	Status
1	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	18.56	Complete
4	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Moderate/Good	7.19	Complete
6	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	33.39	Complete
10	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Poor	25.25	Complete
8	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	77.58	Complete
1	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	15.00	Complete
4	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Moderate/Good	8.22	Complete
6	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	13.40	Complete
7	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	73.06	Complete
10	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Poor	93.20	Complete
9	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	2.63	Complete
1	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	5.28	Complete
4	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Moderate/Good	12.51	Complete
6	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	24.89	Complete
7	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	5.11	Complete
8	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	0.48	Complete
9	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	1.14	Complete

1	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Low	8.82	Complete	
2	CW112	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	Moderate/Good	40.99	Complete	
3	CW121	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	Moderate/Good	3.93	Complete	
5	CW143	Heathy shrublands on rocky outcrops of the western slopes	Moderate/Good	25.60	Complete	
6	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Moderate/Good	292.08	Complete	
7	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	91.42	Complete	
10	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Poor	50.44	Complete	
8	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Medium	38.70	Complete	
9	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Other	4.77	Complete	
10	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good_Poor	60.56	Complete	
7	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Moderate/Good	27.85	Complete	

Threatened species

ID	TS subzone No	Adjacent remnant veg area (ha)	Patch size (ha)	
6578	1a	0.00	501.00	Edit Delete
6579	4a	501.00	501.00	Edit Delete
6580	6a	501.00	501.00	Edit Delete
6581	10a	0.00	501.00	Edit Delete
6582	8a	501.00	501.00	Edit Delete
6583	1b	0.00	501.00	Edit Delete
6584	4b	501.00	501.00	Edit Delete
6585	6b	501.00	501.00	Edit Delete
6586	7b	501.00	501.00	Edit Delete

6588	9	2.63	501.00	Edit Delete
6589	1b	0.00	501.00	Edit Delete
6590	4b	501.00	501.00	Edit Delete
6591	6c	501.00	501.00	Edit Delete
6592	7a	501.00	501.00	Edit Delete
6593	10b	0.00	501.00	Edit Delete
6594	8c	501.00	501.00	Edit Delete
6595	9a	0.00	501.00	Edit Delete
6596	1c	0.00	501.00	Edit Delete
6597	2a	501.00	501.00	Edit Delete
6598	3a	501.00	501.00	Edit Delete
6599	5a	501.00	501.00	Edit Delete
6600	6d	501.00	501.00	Edit Delete
6601	7e	501.00	501.00	Edit Delete
6602	10c	501.00	501.00	Edit Delete
6603	8c	501.00	501.00	Edit Delete
6604	9c	4.77	501.00	Edit Delete
6605	10d	0.00	501.00	Edit Delete
6606	7c	501.00	501.00	Edit Delete

BIOBANK SITE: Screen shot of Step 2 geographic features selections

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Assessment of geographic / habitat features

Are any of the following features located on the proposed BioBank site? Tick the box wherever the feature is located, or leave blank if the feature is not located.

Impact?	Common name	Scientific name	Feature
☑	Narrow Goodenia	Goodenia macbarronii	seasonally wet/boggy sites (including table drains)
☑	Large-eared Pied Bat (Breeding)	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
☑	Large-eared Pied Bat	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
☐	Brush-tailed Rock-wallaby	Petrogale penicillata	rocky outcops/cliffs in Bathurst CMA subregion
☑	Small Purple-pea	Swainsona recta	land containing a forb-rich grassy groundlayer
☑	Eastern Bentwing-bat (Breeding)	Miniopterus schreibersii oceanensis	land containing caves or similar structures
☑	Zieria obcordata	Zieria obcordata	land containing granite boulders on rocky outcrops.

BIOBANK SITE: Screen shot of Step 4 showing site survey times and species requiring an expert report

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Go to predicted threatened species

Survey time matrix

Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acacia ausfeldii	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No
Callocephalon fimbriatum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chalinolobus dwyeri	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Chalinolobus dwyeri	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Diuris tricolor	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Goodenia macbarronii	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Grevillea divaricata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hieraaetus morphnoides	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lophoictinia isura	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Miniopterus schreibersii oceanensis	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Phascogale tapoatafa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Philotheca ericifolia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rulingia procumbens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Swainsona recta	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
Swainsona sericea	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Zieria obcordata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Predicted threatened species

Scientific name *	Common name	Tg value	On site *	
Burhinus grallarius	Bush Stone-curlew	0.40	Yes	Edit
Cacatua leadbeateri	Pink Cockatoo	0.53	Yes	Edit
Calyptorhynchus lathami	Glossy Black-cockatoo	0.55	Yes	Edit
Chalinolobus picatus	Little Pied Bat	0.48	Yes	Edit
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	0.50	Yes	Edit
Dasyurus maculatus	Spotted-tailed Quoll	0.35	Yes	Edit
Glossopsitta pusilla	Little Lorikeet	0.58	Yes	Edit
Grantiella picta	Painted Honeyeater	0.75	Yes	Edit
Lathamus discolor	Swift Parrot	0.75	Yes	Edit
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	0.75	Yes	Edit
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	0.75	Yes	Edit
Neophema pulchella	Turquoise Parrot	0.55	Yes	Edit
Ninox connivens	Barking Owl	0.33	Yes	Edit
Ninox strenua	Powerful Owl	0.33	Yes	Edit
Nyctophilus timoriensis	Greater Long-eared Bat (south eastern form)	0.48	Yes	Edit
Pachycephala inornata	Gilbert's Whistler	0.75	Yes	Edit
Petaurus norfolcensis	Squirrel Glider	0.45	Yes	Edit
Petroica boodang	Scarlet Robin	0.60	Yes	Edit
Petroica phoenicea	Flame Robin	0.60	Yes	Edit
Phascolarctos cinereus	Koala	0.83	Yes	Edit
Polytelis swainsonii	Superb Parrot	0.53	Yes	Edit
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	0.75	Yes	Edit
Pyrrholaemus saggitatus	Speckled Warbler	0.40	Yes	Edit
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	0.45	Yes	Edit
Stagonopleura guttata	Diamond Firetail	0.75	Yes	Edit
Tyto novaehollandiae	Masked Owl	0.33	Yes	Edit
Xanthomyza phrygia	Regent Honeyeater	0.75	Yes	Edit

BIOBANK SITE: Screen shot showing Step 5a – Red Flag Status of each vegetation type

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	1
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone: EEC and red flag

Transect / Plot | Management scores

Vege-tation type	Vegetation type name	Percent cleared in CMA	EEC? *	Red flag?	Area (ha)	Condition	Min. number of Transect / Plots	Transect / Plot complete	Mgmt score complete?	
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	18.56	Low	2	2	Yes	Edit
CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South	Yes	7.19	Moderate/Good	3	4	Yes	Edit
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	33.39	Moderate/Good	4	6	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	25.25	Moderate/Good_Poor	4	6	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	77.58	Moderate/Good_Medium	5	5	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	15.00	Low	2	2	Yes	Edit
CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South	Yes	8.22	Moderate/Good	3	4	Yes	Edit
CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	13.40	Moderate/Good	3	6	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	73.06	Moderate/Good	5	5	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	93.20	Moderate/Good_Poor	5	6	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	2.63	Moderate/Good_Other	2	3	Yes	Edit
CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	5.28	Low	2	2	Yes	Edit

	CW138	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	95	not an EEC	Yes	12.51	Moderate/Good	3	4	Yes	Edit
	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	24.89	Moderate/Good	4	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	5.11	Moderate/Good	3	4	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	0.48	Moderate/Good_Medium	1	5	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	1.14	Moderate/Good_Other	1	3	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	No	8.82	Low	2	2	Yes	Edit
	CW112	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	95	not an EEC	Yes	40.99	Moderate/Good	4	4	Yes	Edit
	CW121	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	95	not an EEC	Yes	3.93	Moderate/Good	2	4	Yes	Edit
	CW143	Heathy shrublands on rocky outcrops of the western slopes	10	not an EEC	No	25.60	Moderate/Good	4	4	Yes	Edit
	CW212	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	40	not an EEC	No	292.08	Moderate/Good	7	10	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	91.42	Moderate/Good	5	5	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	50.44	Moderate/Good_Poor	5	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	38.70	Moderate/Good_Medium	4	5	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	4.77	Moderate/Good_Other	3	3	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	69	not an EEC	No	60.56	Moderate/Good_Poor	5	6	Yes	Edit
	CW213	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	90	not an EEC	Yes	27.85	Moderate/Good	4	4	Yes	Edit

BIOBANK SITE: Screen shot showing Step 5b - or Table detailing survey results of survey transects/plots.

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 22	6	0.00	0.00	90.00	0.00	0.00	35.00	0	0.00	0.00	653120	6404795	55	Edit	Remove
Plot 23	4	0.00	0.00	100.00	0.00	0.00	6.00	0	0.00	0.00	652115	6405135	55	Edit	Remove

Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW138_Moderate/Good
Vegetation Type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 1	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 2	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Poor
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 22	6	0.00	0.00	90.00	0.00	0.00	35.00	0	0.00	0.00	653120	6404795	55	Edit	Remove
Plot 23	4	0.00	0.00	100.00	0.00	0.00	6.00	0	0.00	0.00	652115	6405135	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW138_Moderate/Good
Vegetation Type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 1	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 2	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove
Benchmark	25	29.50	13.50	50.00	5.50	5.50	5.00	5	0.50	66.00	650000	6500000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Poor
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 22	6	0.00	0.00	90.00	0.00	0.00	35.00	0	0.00	0.00	653120	6404795	55	Edit	Remove
Plot 23	4	0.00	0.00	100.00	0.00	0.00	6.00	0	0.00	0.00	652115	6405135	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW138_Moderate/Good
Vegetation Type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 1	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.66	66.00	650000	6400000	55	Edit	Remove
Benchmark lower 2	25	12.00	1.00	15.00	3.00	3.00	26.00	1	0.66	66.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Low
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 22	6	0.00	0.00	90.00	0.00	0.00	35.00	0	0.00	0.00	653120	6404795	55	Edit	Remove
Plot 23	4	0.00	0.00	100.00	0.00	0.00	6.00	0	0.00	0.00	652115	6405135	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW112_Moderate/Good
Vegetation Type	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.60	66.00	650000	6400000	55	Edit	Remove
Benchmark Lower 1	25	12.00	1.00	15.00	3.00	3.00	20.00	1	0.60	66.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	25	25.00	35.00	25.00	70.00	5.00	5.00	1	0.60	66.00	650000	6400000	55	Edit	Remove
Benchmark Lower 2	25	12.00	1.00	15.00	3.00	3.00	20.00	1	0.60	66.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW121_Moderate/Good
Vegetation Type	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	30	8.00	3.00	3.00	3.00	3.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Lower 1	30	35.00	35.00	25.00	25.00	25.00	20.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	30	8.00	3.00	3.00	3.00	3.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Lower 2	30	35.00	35.00	25.00	25.00	25.00	20.00	2	1.00	46.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW143_Moderate/Good
Vegetation Type	Heathy shrublands on rocky outcrops of the western slopes

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=30	10.0 to 40.0	0.0 to 1.0	5.0 to 10.0	10.0 to 25.0	3.0 to 5.0	See Manual	>=0	1.00	>=0	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Benchmark Upper 1	30	30.00	40.00	1.00	10.00	25.00	5.00	0	1.00	66.00	650000	6400000	55	Edit	Remove
Benchmark Lower 1	30	10.00	0.00	5.00	10.00	3.00	10.00	0	1.00	66.00	650000	6400000	55	Edit	Remove
Benchmark Upper 2	30	30.00	40.00	1.00	10.00	25.00	5.00	0	1.00	66.00	650000	6400000	55	Edit	Remove
Benchmark Lower 2	30	10.00	0.00	5.00	10.00	3.00	10.00	0	1.00	66.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW212_Moderate/Good
Vegetation Type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers	
>=30	8.0 to 35.0	3.0 to 35.0	3.0 to 25.0	3.0 to 25.0	3.0 to 25.0	See Manual	>=2	1.00	>=46	☐	Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 18	39	37.50	13.50	30.00	6.00	16.00	0.00	1	1.00	24.00	651795	6406523	55	Edit	Remove
Plot 20	28	32.00	0.00	50.00	10.00	30.00	2.00	1	1.00	45.00	651647	6410866	55	Edit	Remove
Plot 7	13	2.00	0.00	60.00	2.00	20.00	70.00	0	1.00	0.00	653112	6409915	55	Edit	Remove
Plot 8	24	19.00	0.00	60.00	0.00	78.00	38.00	1	1.00	36.00	653552	6410829	55	Edit	Remove
Plot 9	29	35.50	2.00	38.00	0.00	28.00	46.00	1	1.00	30.00	653459	6410948	55	Edit	Remove
Plot 13	12	46.50	0.00	40.00	0.00	46.00	0.00	0	1.00	0.00	653061	6409650	55	Edit	Remove
Benchmark Plot 1	30	34.00	34.00	25.00	25.00	25.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Plot 2	30	34.00	34.00	25.00	25.00	25.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Plot 3	30	34.00	34.00	25.00	25.00	25.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove
Benchmark Plot 4	30	34.00	34.00	25.00	25.00	25.00	5.00	2	1.00	46.00	650000	6400000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove
Benchmark Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	9	0.50	50.00	650000	6500000	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Poor
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Medium
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove
Plot 24A	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 4	25	6.00	70.00	12.00	12.00	32.00	6.00	1	1.00	20.00	653015	6410863	55	Edit	Remove
Plot 24	21	50.00	0.00	80.00	0.00	30.00	10.00	2	1.00	19.00	651584	6404650	55	Edit	Remove
Plot 26	35	35.00	30.00	90.00	0.00	35.00	25.00	6	1.00	30.00	649582	6423635	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Other
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 2	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2A	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove
Plot 2B	32	10.50	3.50	78.00	0.00	50.00	4.00	0	1.00	6.00	653076	6411302	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good_Poor
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 19	5	2.00	0.00	80.00	0.00	10.00	30.00	1	0.00	4.00	653159	6408376	55	Edit	Remove
Plot 15	12	2.00	0.00	95.00	0.00	20.00	10.00	1	0.00	0.00	652631	6406797	55	Edit	Remove
Plot 10	17	2.00	0.00	85.00	0.00	10.00	2.00	1	0.00	0.00	653245	6410510	55	Edit	Remove
Plot 6	14	2.00	0.00	92.00	4.00	26.00	8.00	1	0.00	4.00	653417	6410540	55	Edit	Remove
Plot 12	11	2.00	0.00	100.00	0.00	6.00	0.00	1	0.00	0.00	653577	6410420	55	Edit	Remove
Plot 1	15	2.00	0.00	80.00	0.00	60.00	24.00	1	0.00	64.00	654158	6411946	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation Zone	CW213_Moderate/Good
Vegetation Type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)

Benchmarks

Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs	Remove Multipliers
>=25	12.0 to 35.0	1.0 to 25.0	15.0 to 70.0	3.0 to 5.0	3.0 to 20.0	See Manual	>=1	1.00	>=66	☐

Edit

Vegetation Transect / Plot

Transect / Plot	*	*	*	*	*	*	*	*	*	*	Easting*	Northing*	Zone*		
Plot 11	17	10.00	0.00	80.00	2.00	44.00	14.00	9	0.50	30.00	652872	6409815	55	Edit	Remove
Plot 21	12	46.00	0.00	0.00	0.00	5.00	90.00	3	0.50	29.00	651857	6410696	55	Edit	Remove
Plot 16	18	4.50	0.00	65.00	0.00	12.00	6.00	0	0.50	14.00	652316	6406633	55	Edit	Remove
Plot 5	19	13.00	0.50	90.00	0.00	46.00	8.00	5	0.50	55.00	653231	6410675	55	Edit	Remove

BIOBANK SITE: Screen shot showing Step 5c (Management Scores, Management Zone)

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	18.56

Management zone

Site score

ID	Management zone	Area	Status	
6592	MZ1a	18.56	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6578	1a	0.00	MZ1a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type name	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	7.19

Management zone

Site score

ID	Management zone	Area	Status	
6593	MZ4a	7.19	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6579	4a	501.00	MZ4a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	33.39

Management zone

Site score

ID	Management zone	Area	Status	
6594	MZ6a	33.39	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6580	6a	501.00	MZ6a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	25.25

Management zone

Site score

ID	Management zone	Area	Status	
6595	MZ10a	25.25	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6581	10a	0.00	MZ10a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	77.58

Management zone

Site score

ID	Management zone	Area	Status	
6596	MZ8a	77.58	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6582	8a	501.00	MZ8a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	15.00

Management zone

Site score

ID	Management zone	Area	Status	
6597	MZ1b	15.00	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6583	1b	0.00	MZ1b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type name	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	8.22

Management zone

Site score

ID	Management zone	Area	Status	
6598	MZ4b	8.22	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6584	4b	501.00	MZ4b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	13.40

Management zone

Site score

ID	Management zone	Area	Status	
6599	MZ6b	13.40	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6585	6b	501.00	MZ6b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	73.06

Management zone

Site score

ID	Management zone	Area	Status	
6600	MZ7b	73.06	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6586	7b	501.00	MZ7b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	93.20

Management zone

Site score

ID	Management zone	Area	Status	
6601	MZ10b	93.20	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6593	10b	0.00	MZ10b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	2.63

Management zone

Site score

ID	Management zone	Area	Status	
6602	MZ9b	2.63	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6588	9	2.63	MZ9b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.28

Management zone

Site score

ID	Management zone	Area	Status	
6614	MZ1b	5.28	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6589	1b	0.00	MZ1b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type name	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	12.51

Management zone

Site score

ID	Management zone	Area	Status	
6615	MZ4b	12.51	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6590	4b	501.00	MZ4b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	24.89

Management zone

Site score

ID	Management zone	Area	Status	
6616	MZ6c	24.89	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6591	6c	501.00	MZ6c	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.11

Management zone

Site score

ID	Management zone	Area	Status	
6613	MZ7a	5.11	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6592	7a	501.00	MZ7a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.48

Management zone

Site score

ID	Management zone	Area	Status	
6617	MZ8c	0.48	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6594	8c	501.00	MZ8c	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	1.14

Management zone

Site score

ID	Management zone	Area	Status	
6618	MZ9a	1.14	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6595	9a	0.00	MZ9a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type name	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	8.22

Management zone

Site score

ID	Management zone	Area	Status	
6598	MZ4b	8.22	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6584	4b	501.00	MZ4b	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW112_Moderate/Good
Veg type name	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)
Total veg zone area	40.99

Management zone

Site score

ID	Management zone	Area	Status	
6620	MZ2a	40.99	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6597	2a	501.00	MZ2a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW121_Moderate/Good
Veg type name	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)
Total veg zone area	3.93

Management zone

Site score

ID	Management zone	Area	Status	
6621	MZ3a	3.93	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6598	3a	501.00	MZ3a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW143_Moderate/Good
Veg type name	Heathy shrublands on rocky outcrops of the western slopes
Total veg zone area	25.60

Management zone

Site score

ID	Management zone	Area	Status	
6622	MZ5a	25.60	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6599	5a	501.00	MZ5a	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type name	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	292.08

Management zone

Site score

ID	Management zone	Area	Status	
6623	MZ6d	292.08	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6600	6d	501.00	MZ6d	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	91.42

Management zone

Site score

ID	Management zone	Area	Status	
6624	MZ7e	91.42	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6601	7e	501.00	MZ7e	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	50.44

Management zone

Site score

ID	Management zone	Area	Status	
6625	MZ10c	50.44	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6602	10c	501.00	MZ10c	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	38.70

Management zone

Site score

ID	Management zone	Area	Status	
6626	MZ8c	38.70	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6603	8c	501.00	MZ8c	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	4.77

Management zone

Site score

ID	Management zone	Area	Status	
6627	MZ9c	4.77	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6604	9c	4.77	MZ9c	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	60.56

Management zone

Site score

ID	Management zone	Area	Status	
6628	MZ10d	60.56	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6605	10d	0.00	MZ10d	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	60.56

Management zone

Site score

ID	Management zone	Area	Status	
6628	MZ10d	60.56	Complete	Edit Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6605	10d	0.00	MZ10d	Edit

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type name	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	27.85

Management zone

Site score

ID	Management zone	Area	Status		
6629	MZ7c	27.85	Complete	Edit	Remove

Threatened species

ID	TS subzone	Adjacent remnant veg area (ha)	Management zone	
6606	7c	501.00	MZ7c	Edit

BIOBANK SITE: Screen shot showing Step 5d (Management Scores Site Score) – data entry for management zone score including decrease for additionally or increase in site value for additional management.

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	18.56
Management zone	MZ1a
Management zone area	18.56
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	1.00	1.50	1.00	
Native over-storey cover:	0.00	1.00	0.00	
Native mid-storey cover:	0.00	1.00	0.00	
Native ground cover (grasses):	2.00	3.00	2.00	
Native ground cover (shrubs):	0.00	1.00	0.00	
Native ground cover (other):	0.00	1.00	0.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	0.00	0.50	0.00	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
10.42	25.95	10.42	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	7.19
Management zone	MZ4a
Management zone area	7.19
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	0.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	2.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
85.42	96.88	85.42	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	33.39
Management zone	MZ6a
Management zone area	33.39
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	2.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	2.00	3.00	2.00	
Native ground cover (grasses):	1.00	2.00	1.00	
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	2.00	3.00	2.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	1.00	1.50	1.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
58.85	82.03	58.85	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	25.25
Management zone	MZ10a
Management zone area	25.25
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	2.00	
Native over-storey cover:	1.00	2.00	1.00	
Native mid-storey cover:	0.00	1.00	0.00	
Native ground cover (grasses):	2.00	3.00	2.00	
Native ground cover (shrubs):	1.00	2.00	1.00	
Native ground cover (other):	2.00	3.00	2.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	0.00	0.50	0.00	
Total length of fallen logs:	1.00	1.50	1.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
39.06	63.98	39.06	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	77.58
Management zone	MZ8a
Management zone area	77.58
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	2.50	Will not be altered
Native mid-storey cover:	2.00	3.00	2.50	Will not be altered
Native ground cover (grasses):	2.00	3.00	2.50	Will not be altered
Native ground cover (shrubs):	2.00	3.00	2.50	Will not be altered
Native ground cover (other):	1.00	2.00	1.50	Will not be altered
Exotic plant cover:	2.00	3.00	2.50	Will not be altered
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
70.14	90.62	78.82	8.68

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	15.00
Management zone	MZ1b
Management zone area	15.00
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	1.00	1.50	1.00	
Native over-storey cover:	0.00	1.00	0.00	
Native mid-storey cover:	0.00	1.00	0.00	
Native ground cover (grasses):	2.00	3.00	2.00	
Native ground cover (shrubs):	0.00	1.00	0.00	
Native ground cover (other):	0.00	1.00	0.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	0.00	0.50	0.00	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
10.42	**25.95**	**10.42**	**0.00**

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	8.22
Management zone	MZ4b
Management zone area	8.22
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	0.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	2.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
85.42	96.88	85.42	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	13.40
Management zone	MZ6b
Management zone area	13.40
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	2.00	3.00	3.00	
Native ground cover (grasses):	1.00	2.00	3.00	control feral herbivores and pigs (PT
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	1.00	1.50	1.50	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
58.85	82.03	83.59	24.74

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	73.06
Management zone	MZ7b
Management zone area	73.06
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	2.00	3.00	3.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	2.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
74.48	100.00	100.00	25.52

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	93.20
Management zone	MZ10b
Management zone area	93.20
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	2.00	
Native over-storey cover:	1.00	2.00	1.00	
Native mid-storey cover:	0.00	1.00	0.00	
Native ground cover (grasses):	2.00	3.00	2.00	
Native ground cover (shrubs):	1.00	2.00	1.00	
Native ground cover (other):	2.00	3.00	2.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	0.00	0.50	0.00	
Total length of fallen logs:	1.00	1.50	1.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
39.06	**63.98**	**39.06**	**0.00**

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	2.63
Management zone	MZ9b
Management zone area	2.63
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	3.00	White Cypress Pine Thinning
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	
Native ground cover (other):	0.00	1.00	1.00	
Exotic plant cover:	3.00	3.00	3.00	
Number of trees with hollows:	0.00	0.00	0.00	Hollow bearing trees re-used from in
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	0.00	0.00	0.50	Logs re-used from impact site

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
55.73	65.62	66.67	10.94

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Low
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.28
Management zone	MZ1b
Management zone area	5.28
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	1.00	1.50	1.50	
Native over-storey cover:	0.00	1.00	1.00	
Native mid-storey cover:	0.00	1.00	1.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	
Native ground cover (other):	0.00	1.00	1.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	0.00	0.50	0.50	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
10.42	**25.95**	**25.95**	**15.53**

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	12.51
Management zone	MZ4b
Management zone area	12.51
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
85.42	96.88	96.88	11.46

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	24.89
Management zone	MZ6c
Management zone area	24.89
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	2.00	3.00	3.00	
Native ground cover (grasses):	1.00	2.00	2.00	
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	1.00	1.50	1.50	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
58.85	82.03	82.03	23.18

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	5.11
Management zone	MZ7a
Management zone area	5.11
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	1.00	2.00	2.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
59.38	85.76	85.76	26.38

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	0.48
Management zone	MZ8c
Management zone area	0.48
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	2.50	Will not be altered. Improvement fror
Native mid-storey cover:	2.00	3.00	2.50	Will not be altered. Improvement fror
Native ground cover (grasses):	2.00	3.00	3.00	Will not be altered. Improvement fror
Native ground cover (shrubs):	2.00	3.00	3.00	Will not be altered. Improvement fror
Native ground cover (other):	1.00	2.00	2.00	Will not be altered. Improvement fror
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
70.14	**90.62**	**85.59**	**15.45**

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	1.14
Management zone	MZ9a
Management zone area	1.14
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	
Native ground cover (other):	0.00	1.00	1.00	
Exotic plant cover:	3.00	3.00	3.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
55.73	65.62	65.62	9.89

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW138_Moderate/Good
Veg type	Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)
Total veg zone area	8.22
Management zone	MZ4b
Management zone area	8.22
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	0.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	2.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	2.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
85.42	96.88	85.42	0.00

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW112_Moderate/Good
Veg type	Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)
Total veg zone area	40.99
Management zone	MZ2a
Management zone area	40.99
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
85.42	**96.88**	**96.88**	**11.46**

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW121_Moderate/Good
Veg type	Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)
Total veg zone area	3.93
Management zone	MZ3a
Management zone area	3.93
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	3.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	3.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
95.83	100.00	100.00	4.17

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW143_Moderate/Good
Veg type	Heathy shrublands on rocky outcrops of the western slopes
Total veg zone area	25.60
Management zone	MZ5a
Management zone area	25.60
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	0.00	1.00	1.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	0.00	1.00	1.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
69.57	83.09	83.09	13.52

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW212_Moderate/Good
Veg type	White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)
Total veg zone area	292.08
Management zone	MZ6d
Management zone area	292.08
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	1.00	2.00	2.00	
Native ground cover (shrubs):	3.00	3.00	3.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	2.00	2.50	2.50	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	2.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
72.40	94.79	94.79	22.39

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	91.42
Management zone	MZ7e
Management zone area	91.42
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	1.00	2.00	2.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	1.00	2.00	2.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	2.00	3.00	3.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
63.72	92.36	92.36	28.64

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	50.44
Management zone	MZ10c
Management zone area	50.44
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	1.00	2.00	2.00	
Native mid-storey cover:	0.00	1.00	1.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	0.00	0.50	0.50	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
39.06	63.98	63.98	24.92

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Medium
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	38.70
Management zone	MZ8c
Management zone area	38.70
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	3.00	
Native mid-storey cover:	2.00	3.00	3.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	2.00	3.00	3.00	
Native ground cover (other):	1.00	2.00	2.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
70.14	90.62	90.62	20.48

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Other
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	4.77
Management zone	MZ9c
Management zone area	4.77
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	3.00	3.00	3.00	
Native over-storey cover:	2.00	3.00	3.00	
Native mid-storey cover:	3.00	3.00	3.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	0.00	1.00	1.00	White Cypress Pine Thinning
Native ground cover (other):	0.00	1.00	1.00	White Cypress Pine Thinning
Exotic plant cover:	3.00	3.00	3.00	
Number of trees with hollows:	0.00	0.00	0.00	
Overstorey regeneration:	3.00	3.00	3.00	
Total length of fallen logs:	0.00	0.00	0.00	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
55.73	65.62	65.62	9.89

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	60.56
Management zone	MZ10d
Management zone area	60.56
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	1.00	2.00	2.00	
Native mid-storey cover:	0.00	1.00	1.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	0.00	0.50	0.50	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
39.06	63.98	63.98	24.92

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good_Poor
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	60.56
Management zone	MZ10d
Management zone area	60.56
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	1.00	2.00	2.00	
Native mid-storey cover:	0.00	1.00	1.00	
Native ground cover (grasses):	2.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	0.00	0.50	0.50	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
39.06	63.98	63.98	24.92

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Vegetation zone	CW213_Moderate/Good
Veg type	White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
Total veg zone area	27.85
Management zone	MZ7c
Management zone area	27.85
Status	Complete

Management zone attribute score

Any additional gain in the site value score requires the approval of the Director General. Additional gain in the site value score will only be approved where it can be demonstrated that additional management actions will be undertaken

	Current score (0-3)	Default Increased Score (0-3)	Score with management (0-3)	Reason for score changes
Native plant species:	2.00	3.00	3.00	
Native over-storey cover:	3.00	3.00	3.00	
Native mid-storey cover:	1.00	2.00	2.00	
Native ground cover (grasses):	3.00	3.00	3.00	
Native ground cover (shrubs):	1.00	2.00	2.00	
Native ground cover (other):	2.00	3.00	3.00	
Exotic plant cover:	2.00	3.00	3.00	
Number of trees with hollows:	3.00	3.00	3.00	
Overstorey regeneration:	2.00	3.00	3.00	
Total length of fallen logs:	1.00	1.50	1.50	

Current Site Value (out of 100)	Default Increased Site Value (out of 100)	Future Site Value (out of 100)	Increase in Site Value
59.38	85.76	85.76	26.38

BIOBANK SITE: Screen shot or Table showing Step 5f – results of targeted species searches

Environment & Heritage

BioBanking
Biodiversity Banking and Offsets Scheme

Assessment details

Assessment details | Proponent details | Landscape value | Vegetation zone | Geographic / habitat feature | Identified population | Site survey details | Site values | Threatened species survey results | Credits

Home

Save | Save & Close | Cancel

* indicates a mandatory item.

Assessment type	Biobank
Proposal ID	127/2013/0742B
Proposal version	2
Proposal name	Dubbo Zirconia Project
CMA	Central West
Street address	Toongi Road, Toongi Dubbo NSW 2380

Threatened species identified

Scientific name *	Common name	Managed at site?	method *	Id	Size of gain	UOM	Survey date	Mgmt zone	Percent gain		

Threatened species identified

Scientific name *	Common name	Managed at site?	method *	Id	Size of gain	UOM	Survey date	Mgmt zone	Percent gain		
										Add	Clear
Species list											
Diuris tricolor	Pine Donkey Orchid	No			0.00	indiv	01/1/1901		60.00	Edit	Remove
Goodenia macbarronii	Narrow Goodenia	No			0.00	indiv	01/1/1901		60.00	Edit	Remove
Grevillea divaricata	Grevillea divaricata	No			0.00	indiv	01/1/1901		60.00	Edit	Remove
Philotheca ericifolia	Philotheca ericifolia	Yes	Survey		3.00	indiv	01/3/2002	MZ5a	19.43	Edit	Remove
Rulingia procumbens	Rulingia procumbens	No				indiv	01/1/1901		60.00	Edit	Remove

Swainsona recta	Small Purple-pea	No	0.00	indiv	01/1/1901	60.00	Edit	Remove
Swainsona sericea	Silky Swainson-pea	No	0.00	indiv	01/1/1901	60.00	Edit	Remove
Zieria obcordata	Zieria obcordata	No	0.00	indiv	01/1/1901	60.00	Edit	Remove
Aprasia parapulchella	Pink-tailed Worm-lizard	Survey Yes	239.00	ha	03/3/2013	60.00	Edit	Remove
Falco hypoleucos	Grey Falcon	Survey Yes	1021.00	ha	01/1/1901	60.00	Edit	Remove
Chalinolobus dwyeri	Large-eared Pied Bat (Breeding)	Survey Yes	0	ha	01/1/1901	60	Edit	Remove
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	Survey Yes	0	ha	01/1/1901	60	Edit	Remove

Note: The screen shot provided corrected an error in the initial calculation used in Proposal ID127/2012/0398D. The Assessment details (Threatened Species Survey Results) could not be saved once corrections were made (deletion of threatened species already included in ecosystem credits). The author contacted OEH Biobanking unit to discuss the issue – the problem is the OEH server and the size of the Proposal ID 127/2012/0398D – corrections made cannot be saved. Hence the screen shots provide the amended Biobanking data – the proposal on the OEH server does not.

Chalinolobus dwyeri	Large-eared Pied Bat	Survey Yes	1021.00	ha	01/1/1901	60.00	Edit	Remove
Chalinolobus picatus	Little Pied Bat	Survey Yes	1021.00	ha	01/3/2012	60.00	Edit	Remove
Lophoictinia isura	Square-tailed Kite	Survey Yes	1021.00	ha	01/1/1901	60.00	Edit	Remove
Phascogale tapoatafa	Brush-tailed Phascogale	No	0.00	ha	01/1/1901	60.00	Edit	Remove
Callocephalon fimbriatum	Gang-gang Cockatoo	No	0.00	ha	01/1/1901	60.00	Edit	Remove
Acacia ausfeldii	Ausfeld's Wattle	No	0.00	indiv	01/1/1901	60.00	Edit	Remove
Hieraaetus morphnoides	Little Eagle	Survey Yes	1021.00	ha	01/1/1901	60.00	Edit	Remove

BIOBANK SITE: Copy of credit requirements generated by biobank or/and development site

BioBanking Credit Calculator

NSW GOVERNMENT Office of Environment & Heritage

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE.

Date of report: 14/06/2013 Time: 1:30:47PM Tool version: 2.0

Biobank details

Proposal ID:	127/2013/0742B
Proposal name:	Dubbo Zirconia Project
Proposal address:	Toongi Road, Toongi Dubbo NSW 2380
Proponent name:	Alkane Resources
Proponent address:	PO Box 910 Dubbo NSW 2380
Proponent phone:	02 6882 2866
Assessor name:	Heidi Kolkert
Assessor address:	PO Box 2028 ARIMDALE NSW 2350
Assessor phone:	0418 324 136
Assessor accreditation:	127

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)

Ecosystem Credit Summary

Vegetation type	Area (ha)	Credits required	Red flag
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	18.56	100	No
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	7.19	52	No
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	33.39	220	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	25.25	154	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	77.58	702	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	15.00	87	No
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	8.22	63	No
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	13.40	177	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	73.06	1,006	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	93.20	606	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	2.63	25	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	5.28	47	No
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	12.51	123	No
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	24.89	302	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	5.11	67	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	0.48	5	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	1.14	10	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	8.82	73	No

Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	3.93	30	No
Heathy shrublands on rocky outcrops of the western slopes	25.60	237	No
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	292.08	3,368	No
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	40.99	374	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	91.42	1,177	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	50.44	572	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	38.70	426	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	4.77	38	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	60.56	730	No
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	27.85	360	No
Total	1,062.05	11,131	

Credit profiles

1. Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277), (CW112)

Number of ecosystem credits required	374
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

2. Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)

Number of ecosystem credits required	63
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

3. Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)

Number of ecosystem credits required	123
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

4. Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201), (CW138)

Number of ecosystem credits required	52
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

5. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	693
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	

6. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	1,006
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

7. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	25
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	0-5 ha

8. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	73
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	

9. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	2,175
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

10. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	38
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	0-5 ha

11. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	787
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	

12. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	365
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

13. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	254
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	

14. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267), (CW213)

Number of ecosystem credits required	769
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

15. Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54), (CW121)

Number of ecosystem credits required	30
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

16. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	177
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

17. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	3,368
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

18. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	302
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	11-30%
Minimum adjacent remnant area class	>100 ha

19. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270), (CW212)

Number of ecosystem credits required	220
CMA sub-region	Upper Slopes - Central West
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

20. Heathy shrublands on rocky outcrops of the western slopes, (CW143)

Number of ecosystem credits required	237
CMA sub-region	Talbragar Valley
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

Species credits

Management actions

Scientific name	Common name	Species Tg value	Final credits
Falco hypoleucos	Grey Falcon	0.74	6126
Chalinolobus dwyeri	Large-eared Pied Bat	0.13	6126
Hieraaetus morphnoides	Little Eagle	0.74	6126
Chalinolobus picatus	Little Pied Bat	0.48	6126
Philotheca ericifolia	Philotheca ericifolia	0.63	6
Aprasia parapulchella	Pink-tailed Worm-lizard	0.35	1434
Lophoictinia isura	Square-tailed Kite	0.74	6126

Note: The screen shot provided corrected an error in the initial calculation used in Proposal ID127/2012/0398D. The Assessment details (Threatened Species Survey Results) could not be saved once correction were made (deletion of threatened species already included in ecosystem credits). The author contacted OEH Biobanking unit to discuss the issue – the problem is the OEH server and the size of the Proposal ID 127/2012/0398D – corrections made cannot be saved. Hence the screen shots provide the amended Biobanking data – the proposal on the OEH server does not. A New report could not be printed.

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	Cat and/or Fox control
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	Exclude miscellaneous feral species
Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277)	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	Cat and/or Fox control
Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	Exclude miscellaneous feral species
Bulloak - White Cypress Pine woodland mainly in the NSW South Western Slopes Bioregion (Benson 54)	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Cat and/or Fox control
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Exclude miscellaneous feral species
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Heathy shrublands on rocky outcrops of the western slopes	Cat and/or Fox control
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Cat and/or Fox control
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Exclude miscellaneous feral species
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Cat and/or Fox control
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Exclude miscellaneous feral species
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)

Veg type benchmarks: CENTRAL WEST

Veg Type Name	Keith Formation Name	Keith Class (2004)	Veg Type ID	Native plant species richness		Native over-storey cover		Native mid-storey cover		Native ground cover (grasses)		Native ground cover (shrubs)		Native ground cover (other)		Cover estimates - Source	Number of trees with hollows	Total length of fallen logs	Hollows & logs - Source
				Richness	Source	L	U	L	U	L	U	L	U	L	U				
Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)	Grassy woodlands	Western Slopes Grassy Woodlands	CW138	25	P	12	35	1	25	15	70	3	5	3	20	P	0.8	66	E
Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Benson 76)	Grassy woodlands	Floodplain Transition Woodlands	CW145	25	P	8	35	3	10	13	50	3	5	3	15	P	1	75	E
Tumbledown Red Gum - Black Cypress Pine - Red Box low woodland of hills of the South Western Slopes	Dry sclerophyll forests (shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	CW202	30	P	8	35	3	35	3	25	3	25	3	25	P	2	46	E
White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270)	Dry sclerophyll forests (shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	CW212	30	P	8	35	3	35	3	25	3	25	3	25	P	2	46	E
White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)	Grassy woodlands	Western Slopes Grassy Woodlands	CW213	25	P	12	35	1	25	15	70	3	5	3	20	P	0.8	66	E

Veg Type Name	Keith Formation Name	Keith Class (2004)	Veg Type ID	Native plant species richness		Native over-storey cover		Native mid-storey cover		Native ground cover (grasses)		Native ground cover (shrubs)		Native ground cover (other)		Cover estimates - Source	Number of trees with hollows	Total length of fallen logs	Hollows & logs - Source
				Richness	Source	L	U	L	U	L	U	L	U	L	U				
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Grassy woodlands	Western Slopes Grassy Woodlands	CW215	25	P	12	35	1	25	15	70	3	5	3	20	P	0.8	66	E
White Box grassy woodland on well drained podsolic clay soils on hills in the NSW South Western Slopes Bioregion (Benson 266)	Grassy woodlands	Western Slopes Grassy Woodlands	CW216	25	P	12	35	1	25	15	70	3	5	3	20	P	0.8	66	E

APPENDIX 9: EPBC OFFSET CALCULATIONS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Pink-tailed Worm-lizard (Aprasia
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Impact calculator

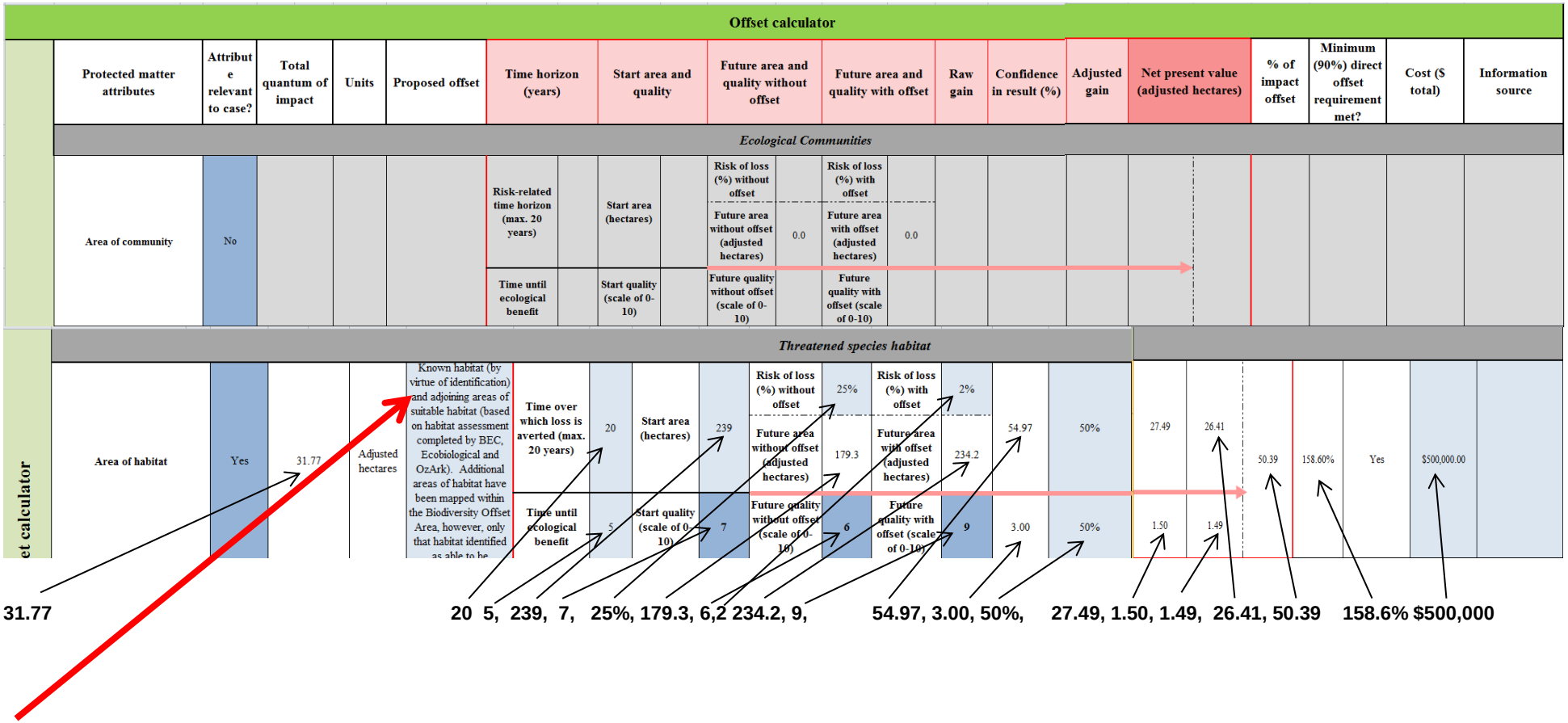
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community Clear row	No		**Area**			
			Quality			
			Total quantum of impact	0.00		

Impact calculator

Threatened species habitat						
Area of habitat Clear row	Yes	Habitat located on a small hill of underlying intrusive trachyte geological formation containing a significant proportion of one sub-population of larger Toongi population of the Pink-tailed Worm-lizard (recently	**Area**	35.3	Hectares	Field Survey conducted by Dr Arthur White of Biosphere Environmental Consultants (BEC). Habitat assessment undertaken by Dr White, assisted by Dr Gilbert Whyte of Ecobiological, Mr Phillip Cameron of OzArk EHM. Refer to Pink-tail Worm-
			Quality	**9**	Scale 0-10	
			Total quantum of impact	31.77	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees Clear row	No					
Condition of habitat Change in habitat condition, but no change in extent Clear row	No					

- Habitat located on a small hill of underlying intrusive trachyte geological formation containing a significant proportion of one sub-population of larger Toongi population of the Pink-tailed Worm-lizard (recently identified as part of ongoing surveys associated with the Proposal).
- Field Survey conducted by Dr Arthur White of Biosphere Environmental Consultants (BEC). Habitat assessment undertaken by Dr White, assisted by Dr Gilbert Whyte of Ecobiological, Mr Phillip Cameron of OzArk EHM. Refer to Pink-tail Worm-lizard Plan of Management prepared by BEC, "Ant Population Monitoring and Soil Surveys within the Habitat of the Pink-tailed Worm Lizard Dubbo Zirconia Project Toongi, NSW" prepared by Ecobiological and Habitat Assessment Score Sheets generated by OzArk with input from BEC and Klienfelder Ecobiological.

Threatened species					
Birth rate e.g. Change in nest success Clear row	Yes			%	
Mortality rate e.g Change in number of road kills per year Clear row	Yes			%	
Number of individuals e.g. Individual plants/animals Clear row	Yes			Count	



Known habitat (by virtue of identification) and adjoining areas of suitable habitat (based on habitat assessment completed by BEC, Ecobiological and OzArk). Additional areas of habitat have been mapped within the Biodiversity Offset Area, however, only that habitat identified as able to be maintained or improved to habitat quality score of 9 (equivalent to the habitat quality score of the impacted habitat) has been included. This includes 30ha of low condition habitat (quality score = 4), 113.6ha of moderate condition habitat (quality score = 7) and 80.9ha of good condition habitat (quality score = 9). Time until ecological benefit has been based upon similar habitat restoration techniques being undertaken in the same vegetation types in the Dubbo LGA (Cameron 1999).

Offs	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
	Number of features e.g. Nest hollows, habitat trees	No															
	Condition of habitat Change in habitat condition, but no change in extent	No															
	Threatened species																
	Birth rate e.g. Change in nest success	No															
	Mortality rate e.g Change in number of road kills per year	No															
	Number of individuals e.g. Individual plants/animals	No															

Summary								
	Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
						Direct offset ($)	Other compensatory measures ($)	Total ($)
Summary	Birth rate	0				$0.00		$0.00
	Mortality rate	0				$0.00		$0.00
	Number of individuals	0				$0.00		$0.00
	Number of features	0				$0.00		$0.00
	Condition of habitat	0				$0.00		$0.00
	Area of habitat	31.77	50.39	158.60%	Yes	$500,000.00	N/A	$500,000.00
	Area of community	0				$0.00		$0.00
						$500,000.00	**$0.00**	**$500,000.00**

Pink-tailed Worm-lizard habitat calculations data.

Habitat Area	Study Area						Impact Area						BOS Area					
	Low		Moderate		High		Low		Moderate		High		Low		Moderate		High	
	Area	*Score (/25)*	Area	*Score (/25)*	Area	*Score (/25)*	Area	*Score (/10)*	Area	*Score (/10)*	Area	*Score (/10)*	Area	*Score (/10)*	Area	*Score (/10)*	Area	*Score (/10)*
1a					25.5	*23*					25.5	*9.2*						
1b			8.2	*19*					8.2	*7.6*								
2a			12.7	*18*											12.7	*7.2*		
2b	7.6	*15*											7.6	*6*				
2c					9.7	*22*											9.7	*8.8*
3a	255.7	*11*																
3b			11.8	*15*											11.8	*6*		
3c					26.8	*20*											26.8	*8*
3d			19.6	*15*														
4a			3	*17*					0.2	*6.8*					2.8	*6.8*		
4b	10.4	*10*											10.4	*4*				
4c					9.1	*20*											9.1	*8*
4d			35.1	*17*					1.4	*6.8*					33.7	*6.8*		
4e					26.8	*20*											26.8	*8*
5			10.6	*16*											10.6	*6.4*		
6a			4.1	*19*											4.1	*7.6*		
6b					9.9	*21*											9.9	*8.4*
7	17	*11*																
8			74.1	*15*											39	*6*		
9	52.6	*13*																
10	24	*13*											24	*5.2*				
Total	**367.3**		**179.2**		**107.8**		**0**		**9.8**		**25.5**		42		114.7		82.3	
Condition								***Area***	**35.3**	***Average Condition***		**8.7**		***Area***	**239**	***Average Condition***		**6.8**

Habitat Scoring Sheets

Summary

Area	score	Quality
Area 4b	10/25	Low Quality Habitat
Area 3a	11/25	Low Quality Habitat
Area 7	11/25	Low Quality Habitat
Area 9	13/25	Low Quality Habitat
Area 10a	13/25	Low Quality Habitat
Area 2b	15/25	Moderate Quality Habitat
Area 3b	15/25	Moderate Quality Habitat
Area 3d	15/25	Moderate Quality Habitat
Area 8	15/25	Moderate Quality Habitat
Area 5	16/25	Moderate Quality Habitat
Area 4d	17/25	Moderate Quality Habitat
Area 4a	17/25	Moderate Quality Habitat
Area 2a	18/25	Moderate Quality Habitat
Area 1b	19/25	Moderate Quality Habitat
Area 6a	19/25	Moderate Quality Habitat
Area 3c	20/25	High Quality Habitat
Area 4e	20/25	High Quality Habitat
Area 4c	20/25	High Quality Habitat
Area 10b	21/25	High Quality Habitat
Area 2c	22/25	High Quality Habitat
Area 1a	23/25	High Quality Habitat

See **Figures A and B**

Figure A: Pink-tailed Worm-Lizard Habitat (showing underlying Geology)

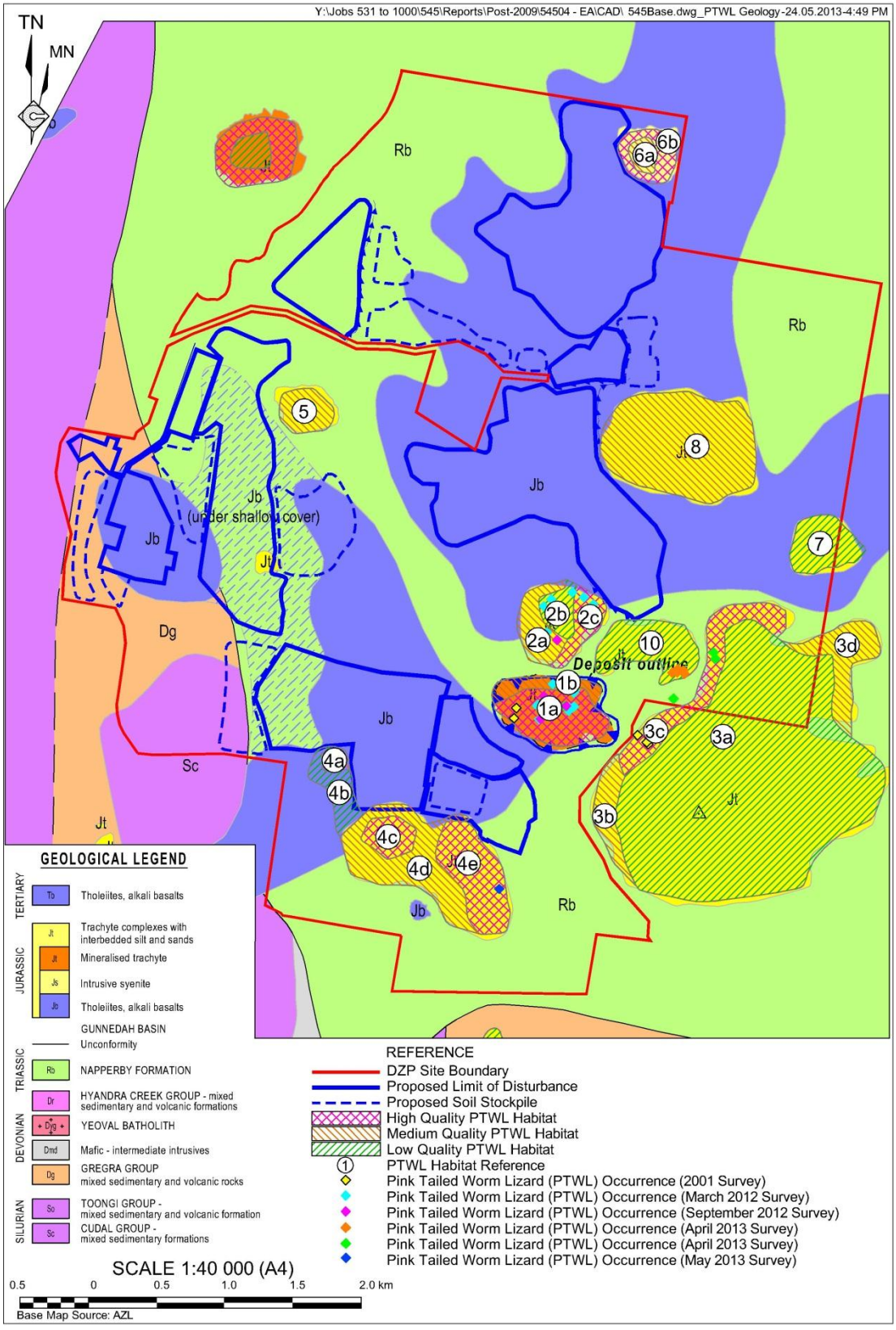
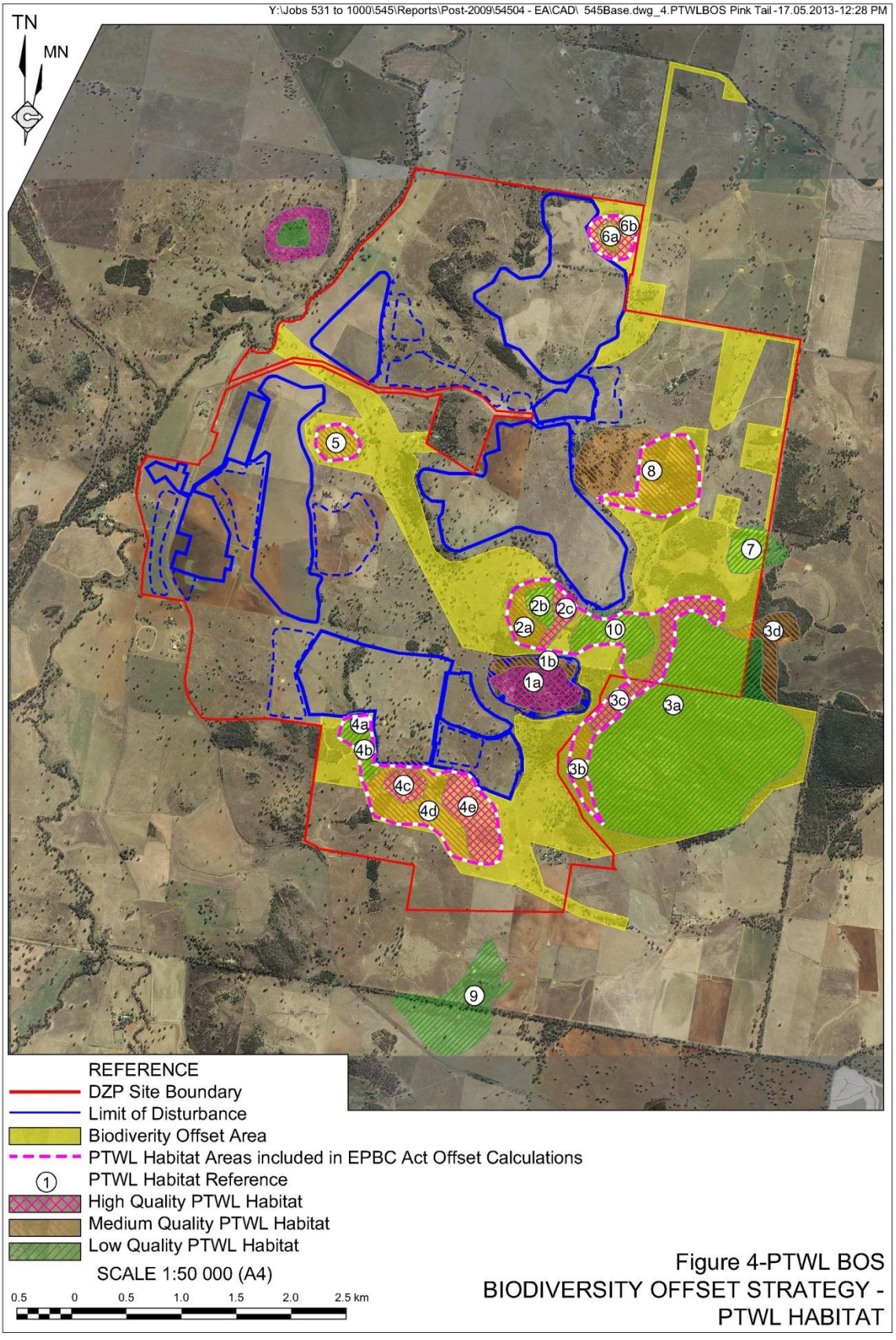


Figure B: Pink-tailed Worm-Lizard Habitat (showing Biodiversity Offset Area)



Template Sheet

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		/1
	Well-Draining Soil	Sandy Loam = 2	/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	/1
		Ant nests present = 1	
		Total	**/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged; however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	5/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	2/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	3/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	5/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**23/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			

Area 1a	**23/25**	**High Quality Habitat**

High Quality Habitat =	**20-25**
Moderate Quality Habitat =	**14-19**
Low Quality Habitat =	**8-13**
No Habitat =	**0-7**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**19/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			

Area 1b	**19/25**	**Moderate Quality Habitat**

High Quality Habitat = **20-25**
Moderate Quality Habitat = **14-19**
Low Quality Habitat = **8-13**
No Habitat = **0-7**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	5/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	1/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	1/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	3/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**18/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 2a	**18/25**	**Moderate Quality Habitat**	

High Quality Habitat = **20-25**
Moderate Quality Habitat = **14-19**
Low Quality Habitat = **8-13**
No Habitat = **0-7**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	5/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		0/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	1/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	1/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	1/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**15/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			

Area 2b **15/25** **Moderate Quality Habitat**

High Quality Habitat = **20-25**
Moderate Quality Habitat = **14-19**
Low Quality Habitat = **8-13**
No Habitat = **0-7**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	5/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**22/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 2c	**22/25**	**High Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	3/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**11/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area3a	**11/25**	**Low Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	2/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	2/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	3/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**15/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 3b	15/25	Moderate Quality Habitat	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**20/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 3c	**20/25**	**High Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**15/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	2/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	2/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	3/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**15/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 3d	15/25	Moderate Quality Habitat	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	3/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	1/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**17/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4a	**17/25**	**Moderate Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	1/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**10/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 4b	**10/25**	**Low Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	2/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	3/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	3/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	5/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**20/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4c	**20/25**	**High Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	2/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**17/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 4d	17/25	Moderate Quality	

High Quality Habitat = 20-25
Moderate Quality Habitat = 14-19
Low Quality Habitat = 8-13
No Habitat = 0-7

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**20/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 4e	**20/25**	**High Quality Habitat**	

High Quality Habitat = 20-25
Moderate Quality Habitat = 14-19
Low Quality Habitat = 8-13
No Habitat = 0-7

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**16/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 5	16/25	Moderate Quality Habitat	

High Quality Habitat = 20-25
Moderate Quality Habitat = 14-19
Low Quality Habitat = 8-13
No Habitat = 0-7

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		0/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**19/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 6a	**19/25**	**Moderate Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**21/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 6b	**21/25**	**High Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1 Sandy Clay Loam = 2	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	1/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	1/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	1/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**11/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 7	**11/25**	**Low Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2 Sandy Clay Loam = 1	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	2/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	2/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	3/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**15/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 8	**15/25**	**Moderate Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1 Record <20 years = 2 Record <10 years = 3 Record <5 years = 4 Record <2 years = 5	0/5
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1 Sandy Clay Loam = 2	1/2
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1 <40% Canopy Coverage = 2 <20% Canopy Coverage = 3	3/3
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1 >50% Coverage or > 6 grass species (20 x 20 Area) = 2 >75% Coverage or > 10 grass species (20 x 20 Area) = 3	1/3
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0 Occasional suitable rocks present = 1 <6 or >10 suitable rocks present (per $10m^2$) = 3 6-10 suitable rocks present (per $10m^2$) = 5	1/5
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0 Sedimentary = 1 Basalt = 3 Intermediate Volcanics (trachyte) = 5	5/5
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0 Ant nests present = 1	1/1
		Total	**13/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 9	**13/25**	**Low Quality Habitat**

High Quality Habitat = **20-25**
Moderate Quality Habitat = **14-19**
Low Quality Habitat = **8-13**
No Habitat = **0-7**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	1/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**13/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 10a	**13/25**	**Low Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osbome et al 1991; Osbome and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found where the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**21/25**
Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			
Area 10b	**21/25**	**High Quality Habitat**	
High Quality Habitat =	**20-25**		
Moderate Quality Habitat =	**14-19**		
Low Quality Habitat =	**8-13**		
No Habitat =	**0-7**		

This page has been intentionally left blank

APPENDIX 10: ASSESSMENTS OF SIGNIFICANCE

This page has been intentionally left blank

7-Part Tests

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
1) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	Local Population: Koalas are known to periodically occur around Dubbo, specifically along the Macquarie River. Koala scats were identified in the Project Area in 2001. No local population is known to occur in the Dubbo LGA, only sporadic records of transient individuals. Evidence of koalas have not been recorded in the Project Area since 2001 according to property owners. Furthermore, Dubbo LGA is not identified in Schedule 1 of SEPP 44. Given the limited impact footprint in potential Koala habitat only a very small portion of Koala 'feed trees' will be impacted as a result of the Proposal. Clearing of some isolated White Box (feed tree species) is unlikely to affect the life cycle of the species such that a viable local population is likely to be placed at risk of extinction. Habitat more suited to Koalas occurs within riparian areas associated with Wambangalang Creek and the Macquarie River. These areas will not be impacted as a result of the Proposal.	Local population: Both parrot species have been recorded feeding and perching on isolated White Box and White Box Grassy Woodland EEC in the DZP Site. Due to the abundance of Box-Gum Woodland and diverse habitats associated with Dowds Hill, all three species are considered likely to occur yearly in the DZP Site during the non-breeding period. Breeding habitat does not occur in the Dubbo LGA for any of these species. The Superb Parrot does not breed in the Dubbo LGA, the Swift parrot breeds in Tasmania and the Regent Parrots closest breeding ground to the DZP Site is Gulgong. Breeding food resources utilised by the Regent Honeyeater (specifically Yellow Box and *Amyema cambagei)*do not occur in densities that would suit a breeding bird. Clearing as a result of the Proposal is unlikely to affect the life cycle of the species such that a viable local population is likely to be placed at risk of extinction.	Local population: All except the Varied Sittella have been recorded in the DZP Site. The Brown Treecreeper is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes. Thus it is likely that a viable local population of this species occurs. A population of Hooded Robins (males, females and juveniles) was noted in the DZP Site in association with derived grasslands, scattered White Box and dense cypress pine regrowth. Thus it is likely that a viable local population of this species occurs. The Diamond Firetail was recorded in association with creeks and rivers in the Project Area. Thus it is likely that a viable local population of this species occurs. The Speckled Warbler was recorded in woodland in the hill area associated with the Open Cut and habitat associated with Dowds Hill. Thus it is likely that a viable local

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
			population of this species occurs. Based on habitat parameters and the presence of species that require similar habitat to the Varied Sittella, it is assumed present. All will have similar habitat adjacent to the DZP Site that will remain untouched as a result of the Proposal. The only area of shrubby vegetation that will be impacted occurs on the Open Cut. Removal of this vegetation and hollow bearing trees (Brown Treecreeper) is unlikely to affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction. Connectivity to large native remnants in the locality is likely to be improved through the BOS proposed for the Project.
2) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant	Not relevant	Not relevant

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
3) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not relevant	Not relevant	Not relevant
4) in relation to habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of	All habitat / resources utilised by threatened species is important. Vegetation to be removed is detailed in **Section 6** of the ecological report. Habitat would not become further fragmented or isolated due to the agricultural nature of the impact areas. Known feed trees within unlikely Koala habitat (isolated White Box) would be removed. Koalas will have similar	All habitat / resources utilised by threatened species is important. Vegetation to be removed is detailed in **Section 6** of the ecological report. Vegetation types in the DZP Site form a habitat component listed by OEH for these species. Furthermore, the Superb Parrot is known to feed in highly modified exotic grass dominated paddocks. Net habitat fragmentation will not occur given the nomadic and opportunistic ecology of this species.	All habitat / resources utilised by threatened species is important. Vegetation to be removed is detailed in **Section 6** of the ecological report. Revegetation is aimed at increasing habitat complexity. Complex shrubby habitat is particularly important to these species. Native ground cover will be improved as a result of the revegetation, offsets, rehabilitation. Furthermore, the Biodiversity Offset Strategy

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	habitat and better quality habitat (River Red Gum) adjacent to the DZP Site that will remain untouched by the Proposal. The amount of habitat to be impacted cannot be considered as core habitat critical to the survival of these species.	Furthermore, the Biodiversity Offset Strategy and rehabilitation in the DZP Site is likely to improve connectivity with isolated remnants in the DZP Site	and rehabilitation in the DZP Site is likely to improve connectivity to isolated remnants for these species. The Proposal is not expected to modify significant areas of feeding habitat or breeding habitat and therefore no impact on the viability of any local populations is expected. The amount of habitat to be impacted cannot be considered as core habitat critical to the survival of these species.
5) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site.	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site. Critical habitat is likely associated with breeding locations.	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site
6) whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	A Koala Recovery Plan (DECC 2008) and National Koala Conservation and Management Strategy 2009–2014 (DEWHA 209) exist for the koala. As an iconic Australian species there is much interest in the conservation of the Koala. Habitat removal is not consistent with these plans. Removal of feed trees and habitat is inconsistent with this plan. However given clearing between riparian vegetation and the Mining Boundary Area, it is unlikely that Koalas would move across the Mining	Recovery and Threat Abatement Plans exist for all three species. • National Recovery Plan for the Swift Parrot (Lathamus discolor) (Birds Australia, 2011) [Recovery Plan]. • Threat Abatement Plan for Predation by Feral Cats (Environment Australia (EA), 1999b) [Threat Abatement Plan]. • National Recovery Plan for the Superb Parrot Polytelis swainsonii (Baker-Gabb, D., 2011) [Recovery Plan] • Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine	There are no recovery or threat abatement plans for this species. Vegetation removal contributes to the threats facing this species.

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
	Boundary Area. The isolated nature of the paddock trees (mainly White Box) also constrains potential Koala movements in the DZP Site. Improving habitat quality and quantity and connectivity to other remnants is consistent with the Recovery Plan for this species.	Species (Department of the Environment and Heritage (DEH), 2005q) [Threat Abatement Plan]. • Regent Honeyeater Recovery Plan - 1999-2003 (Menkhorst, P., N. Schedvin & D. Geering, 1999a) [State Recovery Plan] as Xanthomyza phrygia. Habitat removal is not consistent with these plans. Improving habitat quality and quantity and connectivity to other remnants is consistent with the Recovery Plan for both species.	
7) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to restore native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to native diversity in areas of rehabilitation.
Conclusion	As a known locally occurring population of Koalas does not occur in the DZP Site or the Dubbo LGA, the Proposal is unlikely to cause impact to a locally occurring population of this species such that it is placed at risk of local extinction. A Species Impact Statement	The Proposal will not remove or alter breeding habitat. The Proposal will however reduce the extent of feeding resources within the DZP Site during initial clearing. Feeding resources suitable for these species will be improved and planted in the DZP Site as a result of the Biodiversity Offset Strategy. Furthermore, due to the nomadic and	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site. It is possible that the Project would reduce the extent of a feeding and breeding resources within the Project Area however it is not

7-Part Test Criteria	Koala	Superb Parrot (Polytelis swainsonii), TSC and EPBC Act. Swift Parrot (Lathamus discolor), TSC and EPBC Act. Regent Honeyeater (Anthochaera Phrygia) TSC and EPBC Act	Flame Robin (Petroica phoenicea), TSC Act Hooded Robin (Melanodryas cucullata), TSC Act. Brown Tree-creeper (Climacteris picumnus), TSC Act. Varied Sittella (Daphoenositta chrysoptera), TSC Act. Speckled Warbler (Pyrrholaemus saggitatus), TSC Act. Diamond Firetail (Stagonopleura guttata), TSC Act.
	is not required.	migratory nature of these species, such a small area of feeding habitat cannot be considered critical to their survival. The Proposal is unlikely to cause impact to a locally occurring population of this species such that it is placed at risk of local extinction. A Species Impact Statement is not required.	considered likely to cause a significant impact to the local population. A Species Impact Statement is not required.

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
1) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	Local population: The Grey-crowned Babbler was recorded in abundance in wooded areas in the DZP Site. The Grey-crowned Babbler is known to have feeding and breeding habitat associated with vegetation in the DZP Site. The Dubbo LGA is a stronghold for this species which is very common in the locality. The Black-chinned Honeyeater and Painted Honeyeater have not been recorded in the DZP Site, however based on habitat parameters are predicted to utilise habitat in the DZP Site during some portion of their lifecycle. Both these species are considered to be nomadic	Local population: All birds of prey except the Grey Falcon were recorded in the DZP Site. Due to the mobile nature of these species, hunting grounds in the DZP Site (open agricultural land) cannot be considered critical to the survival of this species, as open agricultural land within a similar woodland matrix is abundant in the locality. All will have similar habitat adjacent to the DZP Site, that will not be impacted as a result of the Proposal. Breeding sites for these birds of prey are more likely to occur in tall trees associated with riparian environments outside the impact area. Unlikely to have habitat critical to the survival of the species in the DZP Site. Thus a viable local population of the species is unlikely to be placed at risk of extinction.	Local population: Barking Owls occur in the DZP Site., breeding hollows known to occur on Wambangalang Creek and the Macquarie River. As no impact will occur to suitable riparian large hollow bearing trees, the Proposal is unlikely to disrupt a local population of Barking Owls. The Masked Owl is considered to have potential to occur in the DZP Site. Although not recorded during the fauna surveys, it is considered present based on the 'precautionary principle.

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
	and follow flowering recourses. Unlikely to have habitat critical to the survival of the species in the DZP Site. Thus a viable local population of the species is unlikely to be placed at risk of extinction.		
2) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant	Not relevant	Not relevant
3) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or (ii) is likely to	Not relevant	Not relevant	Not relevant

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,			
4) in relation to habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Any component of habitat / resource for these threatened species is considered important. The DZP Site contains foraging and potential breeding resources. Vegetation to be removed is detailed in section **Section 6** of the ecological report. Habitat removal will reduce the amount of feeding resources associated with nectar and nectar attracting insects. The Black-chinned Honeyeater and Painted Honeyeater will be impacted by the removal of winter flowering habitat (White Box) whilst the Grey-crowned Babbler will be impacted through the removal of trees that house insects. Grey-crowned Babblers will also feed in cleared derived grass communities. The installation of water reservoirs associated with the Project would increase the availability of water and thus increase insect attracting surfaces. This may have the affect of providing ample food resources for a locally occurring population.	Any component of habitat / resource for these threatened species is considered important. The DZP Site contains hunting and potential breeding resources. Some mature eucalypts (mainly isolated trees) will be removed as part of the Proposal. However due to their isolated nature are unlikely to be roost sites for these species given more preferable roost sites exist outside the impact area. It is unlikely that the Proposal would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline. It is unlikely that the action will adversely affect habitat critical to the survival of the species	

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
	Feeding territories are large making the species locally nomadic. Thus, habitat to be removed in the DZP Site could not be considered critical to the survival of this species. Relatively small areas of foraging, breeding and roosting habitats cannot be considered critical to the survival of the species in context with the broader landscape. It is unlikely that the Proposal would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline. It is unlikely that the action will adversely affect habitat critical to the survival of the species		
5) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site	Critical habitat has not been declared and no habitats considered to be critical to this species survival was identified during the field survey in the DZP Site
6) whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	There are no recovery or threat abatement plans for these species. Vegetation removal contributes to the threats facing this species. However habitat restoration and rehabilitation is consistent with the recovery plans for these species.	There are no recovery or threat abatement plans for these species. Vegetation removal contributes to the threats facing this species. However habitat restoration and rehabilitation is consistent with the recovery plans for these species.	Two recovery plans relevant to these species exist: • Draft Recovery Plan for the Barking Owl • Recovery Plan for the Large Forest Owls Vegetation removal including the removal of large hollow bearing trees contributes to the threats facing this species. However habitat restoration and rehabilitation is consistent with the recovery plans for these species.

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
7) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, removal of dead wood and dead trees and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. ‘Invasion of exotic perennial grasses’ is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, removal of dead wood and dead trees and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. ‘Invasion of exotic perennial grasses’ is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, removal of dead wood and dead trees and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. ‘Invasion of exotic perennial grasses’ is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to native diversity in areas of rehabilitation.
Conclusion	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site and the mobile nature of these birds, It is possible that the Project would reduce the extent of a feeding resource within the DZP Site and may remove potential breeding trees within breeding habitat for these species. However, it is also likely that the Project may increase the availability of insects through water reservoirs. The Proposal is considered unlikely to significantly impact any local population. The removal of habitat is an accumulated threat to these species, however in this instance it would not be detrimental to a locally occurring population. A Species Impact Statement is not required..	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site. A Species Impact Statement is not required.	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site.

7-Part Test Criteria	Glossy Black Cockatoo	Greater Long-eared Bat (Nyctophilus timoriensis / corbeni), TSC and EPBC Acts. Eastern False pipistrelle (Falsistrellus tasmaniensis), TSC Act. Yellow-bellied Sheathtail bat (Saccolaimus flaviventris), TSC Act.	Large-eared Pied Bat (Chalinolobus dwyeri), TSC and EPBC Acts. Eastern Bentwing Bat (Miniopterus schreibersii orianae oceanensis) TSC Act. Little Pied Bat (Chalinolobus picatus), TSC Act.
1) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	Local population: Small families of Glossy Black Cockatoos were recorded daily in the DZP Site, adjacent to the Open Cut. Preferred feed species (Allocasuarina) occur on the Open Cut and on land adjacent to Dowds Hill. The Glossy Black Cockatoo is dependent on large hollow-bearing eucalypts for nest sites. Due to the birds nomadic nature, removal of feed trees and isolated hollow bearing trees is unlikely to affect the life cycle of the species such that a viable local population is likely to be placed at risk of extinction. Similar habitat adjacent to the Open Cut and near Dowds Hill will not be impacted as a result of the Proposal.	Local population: Recorded in the DZP Site. All species generally roost in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Unlikely to have habitat critical to the survival of the species in the DZP Site. In addition to the discrete nature of impacts targeted to disturbed agricultural land, a viable local population of the species is unlikely to be placed at risk of extinction.	Local population: Recorded in the DZP Site. The Eastern Bentwing Bat primary roosts in caves, but also use derelict mines, storm-water tunnels, buildings and other man-made structures The Little Pied Bat roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Available records suggest that the Large-eared Pied Bat largest concentrations of populations appear to be in the sandstone escarpments of the Sydney basin and the north-west slopes. Small rock outcrops occur in the DZP Site. Thus it is possible that all three species have roost sites located in the DZP Site.
2) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant	Not relevant	Not relevant
3) in the case of an	Not relevant	Not relevant	Not relevant

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,			
4) in relation to habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed	All habitat / resources utilised by threatened species is important. Vegetation to be removed is detailed in section 7 of the report. Net habitat fragmentation will not occur given the nomadic and opportunistic ecology of this species. Furthermore, the Biodiversity Offset Strategy and rehabilitation in the DZP Site is likely to improve connectivity with isolated remnants in the DZP Site The Proposal is not expected to modify significant areas of feeding habitat or	All habitat / resources utilised by threatened species is important. Vegetation to be removed is detailed in section 7 of the report. The mobile nature of microbats enables them to occupy foraging and roosting resources outside the DZP Site that are adequate for the species survival. All will have similar habitat adjacent to the DZP Site, that will not be impacted as a result of the Proposal.	These bats have the potential to form individual roost site within cracks and fissures in rock outcrops. They also have the potential to occur within the outcropping shallow cave / rock shelters within the Open Cut area Removal of cracks and fissures within Open Cut area is unlikely to affect the life cycle of the species such that a viable local population is likely to be placed at risk of extinction. Furthermore, pre-clearing checks of hollow bearing trees will ensure that all animals are relocated. No breeding habitat (caves or similar

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	breeding habitat and therefore no impact on the viability of any local populations is expected.		subterranean habitats) would be removed by the proposed works. Shallow rock overhangs within the Open Cut area may be impacted however more suitable rocky crevices occur on Dowds Hill, which will remain untouched by the Proposal. If used at any time, the potential foraging habitat that occurs in the Project is a very minor component of the habitat available in NSW and is not near a known roost site. The species mobility would enable them to relocate easily to alternative habitats if need be. Thus, the amount of habitat to be impacted cannot be considered as core habitat critical to the survival of these species.
5) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat has not been declared and no habitats considered to be critical to these species survival was identified in the locality	Critical habitat has not been declared and no habitats considered to be critical to these species survival was identified in the locality	Critical habitat has not been declared and no habitats considered to be critical to these species survival was identified in the locality
6) whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	Recovery Plans and Programs have been implemented for the SA population of the Glossy Black cockatoo. Habitat removal is inconsistent with these plans.	There are no recovery or threat abatement plans for this species. The only relevant document is the Action Plan for Australian Bats (Environment Australia 1999). Clearing of native vegetation is inconsistent with this document.	There are no recovery or threat abatement plans for these species. The only relevant document is the Action Plan for Australian Bats (Environment Australia 1999). Clearing of native vegetation is inconsistent with this document.

7-Part Test Criteria	Black-chinned Honeyeater (Melithreptus gularis gularis), TSC Act. Painted Honeyeater (Grantiella picta), TSC Act. and Grey-crowned Babbler	Little Eagle (Hieraaetus morphnoides), TSC Act; Spotted Harrier (Circus assimilis), TSC Act. Square-tailed Kite (Lophoictinia isura), TSC Act. Grey Falcon (Falco hypoleucos), TSC Act.	Barking Owl (Ninox connivens), TSC Act. Masked Owl (Tyto novaehollandiae), TSC Act.
7) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to restore native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to restore native diversity in areas of rehabilitation.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to restore native diversity in areas of rehabilitation.
Conclusion	A local population of any of Glossy Black Cockatoos being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site. It is possible that the Project would minimally reduce the extent of a feeding resource within the Project Area however it is not considered likely to cause a significant impact to the local population. A Species Impact Statement is not warranted.	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site It is possible that the Project would reduce the extent of a feeding, roosting and breeding resources within the Project Area however it is not considered likely to cause a significant impact to the local population. A Species Impact Statement is not warranted.	A local population being placed at risk of extinction is unlikely due to the large amount of surrounding analogous habitat adjoining the DZP Site and more suitable rocky crevices located on Dowds Hill. It is possible that the Project would reduce the extent of a feeding resource within the Project Area however it is not considered likely to cause a significant impact to the local population. A Species Impact Statement is not required.

7-Part Test Criteria	Pink-tailed Worm Lizard (Aprasia parapulchella), TSC and EPBC Acts
1) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	Local population: Recorded in the DZP Site on hill areas associated with Trachyte. During the 2001 survey the Pink-tailed Worm Lizard was collected. Further survey during 2012 and 2013 located a further 32 Pink-tailed Worm Lizard locations. The Pink-tailed Worm Lizard Aprasia parapulchella, Vulnerable EPBC Act and TSC Act has been recorded in four distinct sub-populations. The location of these known populations, overlain by the proposed areas of disturbance associated with the Proposal, has been provided as Figure 15 in the report. • Hill 1 – on which the Open Cut is to be developed. Notably, the records are most prevalent on the hill top and eastern aspect. • Hill 2 – on the 'Ugothery' population to the north of the Open Cut. This sub-population would remain undisturbed by the proposed action. • Hill 4 – on the 'Pacific Hill' to the west of the Open Cut. Figure 15 identifies this record within a proposed soil stockpile area, however, the location and design of soil stockpiling operations would be modified to avoid impact on the species. • Hill 6 – 'Grandale' population to the north of the Open Cut Figure 15 identifies this record within a proposed Liquid Residue Storage Facility, however, the location and design of these facilities would be modified to avoid impact on the species. • Hill 7 – Dowds Hill. Two more locations of the species recorded
2) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant
3) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or	Not relevant

7-Part Test Criteria	Pink-tailed Worm Lizard (Aprasia parapulchella), TSC and EPBC Acts
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	
4) in relation to habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Considering these populations as separate entities, the PWTL population identified on Hill 1 (within the proposed open cut) is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction. In reality this population is not isolated and abuts (or is continuous with) a population on Hill 2 which will remain undisturbed. Similarly, activities surrounding Hills 4 (Pacific Hill) and 6 (Grandale) would be modified to ensure these sub-populations remain undisturbed. In fact, the Proponent intends on including these and other potential habitat locations into an area to be managed for conservation in perpetuity under a Property Vegetation Plan which will form a component of a BOS (BOS). A significant wildlife corridor will be created across the Mine Site Boundary from west to east by the permanent dedication and management of land connecting Dowds Hill to Wambangalang Creek. Corridors will also be created to enhance connectivity of potential and identified Pink-tailed Worm Lizard habitat (and inherently other co-occurring species) within the Mine Site Boundary. The corridor will also connect an area identified as being White Box Woodland Threatened Ecological Community (EPBC Act)
5) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat has not been declared. It is likely that critical habitat for this species consists of a collection of habitat features (rock cover, grass cover, presence of symbiotic ants) and land-use activities (degree of grazing pressure and rock collection).
6) whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	A recovery Plan for the Pink-tailed Worm Lizard was published for Canberra in 1995. Habitat removal is not consistent with this plan. However the following specific mitigation measures are noted. • The sequence of the development of the open cut has been modified to limit the impact of the open cut over the initial 10 years. The four western most records of the Pink-tailed Worm Lizard on Hill 1 occur within the proposed 10 year open cut Component Disturbance Areas. However, the majority of records on Hill 1 occur to the east of the 10 year open cut Component Disturbance Areas and by restricting the area of identified habitat during the initial mining phase, time will be provided to allow for the completion of ongoing research, and development and implementation of strategies aimed at extending available habitat and relocating individuals implemented. • The intention is to improve habitat between the Open Cut and Dowds Hill such that the existing population in the impact footprint can naturally migrate. • Any other components of the Mine Site would be relocated or redesigned to avoid identified occurrences of the Pink-tailed Worm Lizard or confirmed habitat, e.g. soil stockpiles over the Pacific Hill (Hill 4) sub-population and

7-Part Test Criteria	Pink-tailed Worm Lizard (Aprasia parapulchella), TSC and EPBC Acts
	LSRF over the Grandale (Hill 6) sub-population. • A research strategy headed by a recognised herpetological expert Dr Arthur White, Dr Gilbert Whyte (entomoloigt) and OzArk local ecologists (Phillip Cameron and Heidi Kolkert) has been commenced and will be continued to gather essential base line data to manage the species. The strategy has to date included monitoring and field identification of the species, identification of critical habitat features, identification of food species (ants), soil ,profiling, underlying geology mapping and trials of 'surrogate' habitat creation (laying of roof tiles to replicate similar sized rocks beneath which the Pink-tailed Worm Lizard is generally observed). The locations of the 'surrogate' habitat creation areas are illustrated on Figure 5. The strategy has community involvement through assistance from the Dubbo Field Naturalists. • Instigate a translocation and monitoring program for animals on Hill 1 and a broader monitoring program for the local population. This will focus on promoting a habitat corridor between the Open Cut and Dowds Hill to facilitate lizard movement and increase available habitat to this species. This will not be undertaken without the consent of the relevant authorities and implementation of actions derived from research undertaken by Dr Arthur White. • Development of a Pink-tailed Worm Lizard Plan of Management incorporating the research and mitigation strategies noted in the preceding point. • Development and implementation of a BOS (BOS) which will incorporate areas of known populations and habitat for the Pink-tailed Worm Lizard. All vegetation remnants possessing Aprasia parapulchella will be increased in area of occupancy and enhanced, with the exception of Hill 1. • Feral animal control. Feral pigs have occurred in the Project Area and Dowds Hill for around 12 months (not recorded in the past 20 years). Without managing habitat on Dowds Hill for conservation there are direct threats to the local population of Pink-tailed Worm Lizard on Dowds Hill. The Proponent has organised the local landholders to control pigs, to date n=20 have been eradicated. • One of the aims of the BOS would be to create vegetation communities to support populations of Aprasia parapulchella. Preliminary assessments to date indicate critical habitat elements i.e. correct underlying geology, rock size / structure are available but the species has not been recorded within it. It is highly suspected that monocultures of Cypress Pine shade out the ground layer and as this species requires a grassy habitat to survive, habitat modification such as thinning or re-instatement of managed fire will be used to return the vegetation to it biological maximum potential. The main objective is to increase the area of occupancy of this species with an approved habitat management program within an approved Plan of Management.

7-Part Test Criteria	Pink-tailed Worm Lizard (Aprasia parapulchella), TSC and EPBC Acts
7) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Schedule 4 of the TSC Act currently lists 36 key threatening processes. KTPs such as: Clearing of native vegetation, and loss of hollow bearing trees, will be exacerbated by the Proposal. Predation by the European red fox (Vulpes vulpes) and Predation by the feral cat (Felis catus), have or are currently occurring with DZP Site. 'Invasion of exotic perennial grasses' is also already occurring in the DZP Site. The Biodiversity Offset Strategy is likely to restore native diversity in areas of rehabilitation.
Conclusion	A local population of this species will be impacted by the development of the Open Cut. A Species Impact Statement is required. However as the Proposal is being approved under Part 4.1 of the EP&A Act, other approvals under the TSC Act such as a Species Impact Statement is not required. Despite this, considerable consultation with the OEH has occurred in relation to this species and the Proposal was determined as a Controlled Action by the federal minister for the Environment under the EPBC Act.

7-Part Test Criteria	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South EEC.	White Box	Inland Grey Box
in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant.	Not relevant.	Not relevant.
in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	Not relevant.	Not relevant.	Not relevant.
in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: • is likely to have an adverse effect on the extent of the ecological community such that its occurrence is likely to be placed at risk of extinction, or • is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The Proposal would not place this EEC at risk of local extinction. Areas of this EEC to be impacted consist of isolated trees in highly disturbed agricultural land. Mitigation measures adopted during the Proposal will ensure this community is avoided where possible.	The Proposal would not place this EEC at risk of local extinction. Areas of this EEC to be impacted consist of isolated trees in highly disturbed agricultural land. Mitigation measures adopted during the Proposal will ensure this community is avoided where possible. White Box Grassy Woodland occurs in the locality in various remnants and within agricultural land.	The Proposal would not place this EEC at risk of local extinction. Areas of this EEC to be impacted consist of isolated trees in highly disturbed agricultural land. Mitigation measures adopted during the Proposal will ensure this community is avoided where possible.
in relation to habitat of a threatened species, population or ecological community: • the extent to which habitat is likely to be removed or modified as a	Approximately 0.12ha of Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South bioregions (CW138).	Approximately 43.3ha of White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland) (CW213 quality remnants) in the DZP Site. Habitat is already highly fragmented.	Approximately 1.08ha of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (CW145) in the Obley Road Realignment Area.

7-Part Test Criteria	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South EEC.	White Box	Inland Grey Box
result of the action proposed, and • whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and • the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Habitat is already highly fragmented. Any component of an EEC is important, however, the action proposed would be limited as much as possible.	Any component of an EEC is important, however, the action proposed would be limited as much as possible.	Habitat is already highly fragmented. Any component of an EEC is important, however, the action proposed would be limited as much as possible.
whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	Critical habitat does not occur in the locality.	Critical habitat does not occur in the locality.	Critical habitat does not occur in the locality.
whether the actions proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	There are no recovery or threat abatement plans for this EEC. However, ongoing protection, management and recovery of remnants on public land will assist in the recovery of this EEC.	A Draft National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland A critically endangered ecological community exists. A significant wildlife corridor will be created across the Mine Site Boundary from west to east by the permanent dedication and management of land connecting Dowds Hill to Wambangalang Creek. Corridors will also be created to enhance connectivity of potential and identified Pink-tailed Worm Lizard habitat (and inherently other co-occurring species) within the Mine Site Boundary. The corridor will also connect an area identified as being White Box Woodland Threatened Ecological Community (EPBC Act)	There are no recovery or threat abatement plans for this EEC However, ongoing protection, management and recovery of remnants on public land will assist in the recovery of this EEC.

7-Part Test Criteria	Fuzzy Box on alluvials of South West Slopes, Darling Riverine Plains & the Brigalow Belt South EEC.	White Box	Inland Grey Box
whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	Clearing of native vegetation, loss of deadwood (stags) and loss of hollows KTPs apply.	Clearing of native vegetation, loss of deadwood (stags) and loss of hollows KTPs apply.	Clearing of native vegetation, loss of deadwood (stags) and loss of hollows KTPs apply.
Conclusion	The Proposal will remove a component of an EEC. Is not likely to cause impact to a locally occurring population of this species such that it is placed at risk of local extinction. A SIS is not warranted.	The Proposal will remove a component of an EEC. Is not likely to cause impact to a locally occurring population of this species such that it is placed at risk of local extinction. A SIS is not warranted.	The Proposal will remove a component of an EEC. Is not likely to cause impact to a locally occurring population of this species such that it is placed at risk of local extinction. A SIS is not warranted.

Assessments of Significance

Criteria	Migratory birds
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	Great Egret (Ardea alba).Cattle Egret (Ardea ibis).White-bellied Sea-Eagle (Haliaeetus leucogaster).Australian Painted Snipe (Rostratula australis).Latham's Snipe (Gallinago hardwickii).White-throated Needletail (Hirundapus caudacutus).Fork-tailed Swift (Apus pacificus).Rainbow Bee-eater (Merops ornatus).Australasian Bittern (Botaurus poiciloptilus).
substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The DZP Site is downstream from an Important Bird Area. There is little evidence to suggest that the DZP Site supports 'important habitat' for migratory species, however it would most likely provide seasonal breeding and feeding grounds. Given their migratory habits, the ephemeral nature of food and habitat resources, and the extent of habitat across their range, it is likely that the existing resources within the DZP Site would be utilised infrequently and on a transitory basis only. Migratory birds are extremely mobile in nature and have a large feeding area that would not be solely reliant on the habitat provided in the pooling water behind the weir or in habitat on the floodplain within the impact footprint. The proximity of wetlands of international importance close by to the DZP Site also reduces the likelihood that habitat in the DZP Site is 'important habitat'. Within the DZP Site migratory wetland species are basically restricted to artificial waterbodies such as the weir habitat, and floodplain during inundation. The Proposal was the potential to reduce the quantity of suitable habitats, however, the larger and more suitable waterbodies (other weirs and Namoi Barwon confluence) are not within the area of proposed disturbance. Given their artificial nature, their size and the highly modified landscape within which they are set these waterbodies are not regarded as important habitat. The creation of additional dams on site could result in a net increase in available habitat for many of these species. Those remaining wetland species for which specific potential impacts need to be considered are discussed separately below, along with those migratory species that do not inhabit wetland areas. Great Egret (*Ardea alba)* and Cattle Egret (*Bubulcus ibis)* These species are predicted to occur, within or nearby to the DZP Site during periods of inundation. There is no record of either in the DZP Site. Any such impacts involving habitat would be minor and may be mitigated by the habitat creation and enhancement activities noted above for other wetland species. The proposed action would have minimal effects on any local population of these species. White-bellied Sea-Eagle (*Haliaeetus leucogaster)* It is unlikely that the White-bellied Sea-Eagle would occur in the DZP Site but not absolute. There is potential for a direct impact associated with the removal of large trees however in this case only ground cover impacts are proposed. Any such impacts involving habitat would be minor and may be mitigated by the retention of large trees (both live and dead), where practical. Australian Painted Snipe(Rostratula australis) and Latham's Snipe(Gallinago hardwickii)

Criteria	Migratory birds
	These species are predicted to occur, within or nearby to the DZP Site, although neither have been recorded previously. Suitable wetland vegetation does not occur in the DZP Site these species would only be expected to occur on the study site occasionally, at best. Potential habitat occurs on the Mia Mia property which has suitable wetland and fringing vegetation and in areas associated with the Macquarie River, There is no potential for a direct impact associated with the Water Pipeline or water extraction point in the Macquarie River. The proposed action is not expected to have any effect on these species. Fork-tailed Swift (Apus pacificus) and White-throated Needletail (*Hirundapus caudacutus)* These species have not been recorded within or nearby the DZP Site however are predicted to have occasional habitat in the DZP Site. Both are aerial species for which the DZP Site will not represent 'important habitat' and no impacts are expected due to the ability of these species to forage over a wide variety of land use, including human infrastructure and large water bodies. Rainbow Bee-eater *Merops ornatus* The Macquarie River is a known place for congregation of flocks and is core breeding habitat for the species. The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will use disturbed sites with sandy soils such as river banks, quarries, cuttings and mines or exposed sites on cleared flats to build its nesting tunnels. Providing that recommendations in this report are followed there will be no impact to individual birds or a long term decrease in the population.
result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The local area has a history of clearing and habitat modification, which has benefited a number of feral and invasive flora and fauna species. The Proponent proposes to ensure the spread of weeds and feral fauna is not enhanced by the project that will contribute to the overall enhancement of habitat for migratory species.
seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	As noted above, the DZP Site is not considered to be an area of 'important habitat' for migratory birds, whether they are wetland or terrestrial species. It is unlikely that en ecological significant proportion of these migratory birds would rely on habitat in the DZP Site, given the multitude of more suitable habitat nearby (Narran Wetlands).

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	Swift Parrot (Lathamus discolour) critically endangered EPBC Act.	Regent Honeyeater (Anthochaera Phrygia) endangered EPBC Act.
lead to a long-term decrease in the size of a important population, or	No important population occurs in the DZP Site. Breeding habitat does not occur in the DZP Site. Individuals were noted in the DZP Site in 2001. Foraging habitat in non-breeding areas of a highly mobile species will not lead to a long-term decrease in the size of an important population.	• No important population occurs in the DZP Site. Breeding habitat does not occur in the DZP Site. No individuals will be directly impacted as a result of the Proposal. • The summer flowering Grey Box to Yellow Box, Kurrajong and mistletoe species provide food for breeding birds, and this loss would probably be of greatest significance to the species. However as breeding habitat does not occur in proximity to the DZP Site this is not likely to be of consequence.
reduce the area of occupancy of an important population, or	Foraging habitat in non-breeding areas of a highly mobile species will not lead to a long-term decrease in the size of an important population.	• Foraging habitat in non-breeding areas of a highly mobile species will not lead to a long-term decrease in the size of an important population.
fragment the existing important population1 into two or more populations, or	No important population has been identified in the Project Area.	• No important population has been identified in the Project Area. As the Regent Honeyeater has not been previously recorded in the DZP Site it is unlikely that an important population exists. The fragmentation of woodlands in general can greatly diminish the ability of the Honeyeater to move across the landscape (D. Geering 2005).

[1] An *important* population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	Swift Parrot (Lathamus discolour) critically endangered EPBC Act.	Regent Honeyeater (Anthochaera Phrygia) endangered EPBC Act.
adversely affect habitat critical2 to the survival of a species, or	Critical habitat has not been declared, however is likely to be associated with breeding habitat in Tasmania, Although non-breeding habitat is important to this species, impact to a small portion of feeding resources within non-breeding habitat of a highly mobile migratory bird will not adversely affect habitat critical3 to the survival of the species.	• Although no critical habitat has been identified, all habitat is important to the recovery of this species.
disrupt the breeding cycle of a population, or	The Proposal will not disrupt the breeding cycle of a population	• The Proposal will not disrupt the breeding cycle of a population

[2] Habitat critical to the survival of a species refers to:
- habitat identified in a recovery plan for the species as habitat critical for those species or communities./or
- habitat listed on the Register of Critical Habitat maintained by the Minister under the Act./or
- areas that are necessary:
- for activities such as foraging, breeding, roosting, or dispersal;
- for succession;
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

[3] Habitat critical to the survival of a species refers to:
- habitat identified in a recovery plan for the species as habitat critical for those species or communities./or
- habitat listed on the Register of Critical Habitat maintained by the Minister under the Act./or
- areas that are necessary:
- for activities such as foraging, breeding, roosting, or dispersal;
- for succession;
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	**Swift Parrot (Lathamus discolour) critically endangered EPBC Act.**	**Regent Honeyeater (Anthochaera Phrygia) endangered EPBC Act.**
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or	Habitat in the DZP Site is already fragmented and isolated as a result of agricultural practices. Project Design has resulted in the majority of impacts (where possible) to be located in these areas. Large remnants in the DZP Site will be incorporated in the Biodiversity Offset Strategy. A significant wildlife corridor will be created across the Mine Site Boundary from west to east by the permanent dedication and management of land connecting Dowds Hill to Wambangalang Creek. Corridors will also be created to enhance connectivity of potential and identified Pink-tailed Worm Lizard habitat (and inherently other co-occurring species such as the Swift Parrot) within the Mine Site Boundary. The corridor will also connect an area identified as being White Box Woodland Threatened Ecological Community (EPBC Act).	• As per the left hand column.
result in invasive species that are harmful to a vulnerable species becoming established in the species habitat, or	Invasive species that are harmful to a vulnerable species becoming established in the species habitat are already present. The Biodiversity Offset Strategy and rehabilitation of the DZP Site will include invasive animal control.	• As per the left hand column.
interferes substantially with the recovery of the species.	The Project will not interfere substantially with the recovery of this species.	• As per the left hand column.
Conclusion	It is unlikely that the Proposal will negatively impact non-breeding feeding resources suitable for the Swift Parrot in the DZP Site. It is more likely that habitat suitable for this species will be increased through the Biodiversity Offset Strategy.	• It is unlikely that the Proposal will negatively impact non-breeding feeding resources suitable for the Swift Parrot in the DZP Site. It is more likely that habitat suitable for this species will be increased through the Biodiversity Offset Strategy. • Vegetation removal is an accumulated threat to these species however in this instance it would not be detrimental to a locally occurring population.

Assessment of Significance

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Greater Long-eared Bat (V) EPBC Act 1999.**	**Koala (V) EPBC Act 1999.**	**Superb Parrot (Polytelis swainsonii) (V) EPBC Act 1999.**
lead to a long-term decrease in the size of an important population, or	Important Population: Positive recording on Anabat, however no Important Population of this species is known to occur in the Project Area. The Greater Long-eared Bat has the potential to utilise hollow bearing trees and decorating bark as roosting habitat. The "Precautionary Principle' has been adopted. Inhabits a variety of vegetation types, including mallee, bulloke Allocasuarina leuhmanni and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground. Foraging habitat: It is determined that it is unlikely that this species would be impacted by the proposed development given the spatial extent of quality habitat in the DZP Site. Roosting habitat: Roosts in tree hollows, crevices, and under loose bark. Likely to roost in tree hollows An Important Population: being placed at risk of extinction is unlikely due to the adjacent analogous habitat adjoining the DZP Site. The removal of foraging and potential roosting habitat is not considered to be a significant amount in relation to the amount	Important Population: No Important Population of Koalas is known to occur in the Dubbo LGA or Mine Site Boundary. Evidence of a Koala was found in the DZP Site in 2001, however landowners and subsequent surveys have not detected Koalas. The Proposal is unlikely to affect the life cycle of the species such that a viable Important Population is likely to be placed at risk of extinction.	The South-western Slopes region does have an important population but it's not considered that Superb Parrots breed in the DZP Site. Blakely's red gum with suitable hollows will be removed by the Proposal. However as the DZP Site is not considered breeding habitat, removal of these trees is unlikely to affect a breeding colony of Superb Parrots. The Proposal will remove flowering resources. Generally winter flowering resources within the DZP Site will be affected (White Box), except for the autumn flowering Grey Box E. microcarpa.

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Greater Long-eared Bat (V) EPBC Act 1999.**	**Koala (V) EPBC Act 1999.**	**Superb Parrot (Polytelis swainsonii) (V) EPBC Act 1999.**
	of similar habitat that will remain unaffected in the DZP Site.		
reduce the area of occupancy of an important population, or	The potential population of Greater Long-eared Bat in the DZP Site is not considered an important population.	The potential population in the DZP Site is not considered an important population.	It is considered unlikely that Proposal will reduce the area of occupancy for this important population. It may reduce the volume of a feeding resource, however, offsets recommended will see this replaced to maintain or improve local biodiversity.
fragment an existing important population into two or more populations, or	There is no identified important population of Greater Long-eared Bats in the DZP Site. The nature of clearing for the proposed development action will not isolate habitat for the Greater Long-eared Bat and will not fragment an existing population into two or more populations due to the species' large foraging range.	There is no identified important population of Koalas in the DZP Site.	The Proposal will not fragment the existing vegetation.
adversely affect habitat critical4 to the survival of a species, or	The mobile nature of the species allows the Greater Long-eared Bat to occupy foraging and roosting resources outside the DZP Site that are adequate for the species survival. Relatively small areas of foraging and	Critical habitat has not been identified for this species. A small portion of available habitat cannot be considered critical to the species survival. It is unlikely that the action will adversely affect habitat critical to the survival	Isolated White Box with suitable hollows will be removed by the Proposal. However as the DZP Site is not considered breeding habitat, removal of these trees is unlikely to affect a breeding colony of Superb Parrots.

[4] Habitat critical to the survival of a species refers to:

habitat identified in a recovery plan for the species as habitat critical for those species or communities./or

i) habitat listed on the Register of Critical Habitat maintained by the Minister under the Act./or
ii) areas that are necessary:

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

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Greater Long-eared Bat (V) EPBC Act 1999.**	**Koala (V) EPBC Act 1999.**	**Superb Parrot (Polytelis swainsonii) (V) EPBC Act 1999.**
	roosting habitats cannot be considered critical to the survival of the species in context with the broader landscape. It is unlikely that the action will adversely affect habitat critical to the survival of the species.	of the species.	Hollows are limited in abundance in the region due to high levels of land clearing therefore a critical habitat element will be lost and not replaced. Breeding habitat is critical for the long term survival of the local population.
disrupt the breeding cycle of a population, or	Little is known about the breeding biology and reproduction of this species. Given the small scale of the proposed disturbance and appropriate habitat surrounding the DZP Site it is unlikely to disrupt the breeding cycle of a population, if one occurs in the DZP Site.	Given the small scale of the proposed disturbance and appropriate habitat surrounding the DZP Site it is unlikely to disrupt the breeding cycle of a population, if one occurs in the DZP Site.	In absence of any information the Proposal is unlikely to disrupt the breeding cycle of the local population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or	The DZP Site contains foraging and roosting resources. The amount of habitat proposed for removed is considered to be a relatively small area in relation to similar habitat remaining adjacent to the DZP Site. The removal of habitat is unlikely to decrease the availability of habitat or result in the decline habitat condition for this species. The large home range of the species allows offsite foraging resources to be used and isolation of habitat will not result from the Proposal. It is unlikely that the Proposal would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.	The removal of habitat is unlikely to decrease the availability of habitat or result in the decline habitat condition for this species.	The Proposal is unlikely to destroy preferred breeding habitat for the species. The Proposal will reduce the quality of habitat available for the species.
result in invasive species that are harmful to a vulnerable species becoming established in the species habitat, or	Invasive species that are harmful to a vulnerable species becoming established in the species habitat are already present. The Biodiversity Offset Strategy and rehabilitation of the DZP Site will include invasive animal	Invasive species that are harmful to a vulnerable species becoming established in the species habitat are already present. The Biodiversity Offset Strategy and rehabilitation of the DZP Site will include invasive animal	Invasive species that are harmful to a vulnerable species becoming established in the species habitat are already present. The Biodiversity Offset Strategy and rehabilitation of the DZP Site will include invasive animal

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Greater Long-eared Bat (V) EPBC Act 1999.**	**Koala (V) EPBC Act 1999.**	**Superb Parrot (Polytelis swainsonii) (V) EPBC Act 1999.**
	control. It is unlikely that further invasive species that are harmful to the Greater Long-eared Bat would become established. Fragmentation of the existing remnant increases the probability of invasion by the European blackbird and starlings. Increased numbers of noisy minors also has the potential to occur.	control. It is unlikely that further invasive species that are harmful to the Koala would become established.	control. Fragmentation of the existing remnant increases the probability of invasion by the European blackbird and starlings. Increased numbers of noisy minors also has the potential to occur.
interferes substantially with the recovery of the species.	The Action Plan for Australian Bats (Duncan et al.. 1999) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific roosting requirements. However, based on the potential ecological impacts of the Proposal on the species as discussed above, it is unlikely that the Proposal would interfere with the recovery of this species.	The National Koala Recovery Plan. Removal of feed trees and habitat is inconsistent with this plan. It is unlikely that the Proposal would interfere with the recovery of this species.	It is unlikely that Proposal will interfere with the natural recovery of this species.
Conclusion	It is unlikely that this species would be significantly impacted by the Project. Referral to the Commonwealth Minister of the Environment is not required.	It is unlikely that this species would be significantly impacted by the Project. Referral to the Commonwealth Minister of the Environment is not required.	It is unlikely that this species will be significantly impacted by the Proposal. Referral to the D-G of SEWPAC is not required.

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Pink-tailed Worm-lizard (V) EPBC Act 1999.**
lead to a long-term decrease in the size of an important population, or	The population of Pink-tailed Worm Lizard, in the DZP Site is considered to be an Important population as the species was not previously known to occur in the Dubbo LGA. The Pink-tailed Worm Lizard, *Aprasia parapulchella*, Vulnerable EPBC Act and TSC Act has been recorded in four distinct sub-populations. The location of these known populations, overlain by the proposed areas of disturbance associated with the Proposal, has been provided in the report. • Hill 1 – on which the Open Cut is to be developed. Notably, the records are most prevalent on the hill top and eastern aspect. • Hill 2 – on the 'Ugothery' population to the north of the Open Cut. This sub-population would remain undisturbed by the proposed action. • Hill 4 – on the 'Pacific Hill' to the west of the Open Cut. Figures in the report identifies this record within a proposed soil stockpile area, however, the location and design of soil stockpiling operations would be modified to avoid impact on the species. • Hill 6 – 'Grandale' population to the north of the Open Cut. Figures in the report identifies this record within a proposed Liquid Residue Storage Facility, however, the location and design of these facilities would be modified to avoid impact on the species. Considering these populations as separate entities, the population on Hill 1 will be significantly impacted by the Proposal. Thus the Proposal will lead to a long-term decrease in the size of an important population. In reality this population is not isolated and abuts (or is continuous with) a population on Hill 2 which will remain undisturbed. Similarly, activities surrounding Hills 4 (Pacific Hill) and 6 (Grandale) would be modified to ensure these sub-populations remain undisturbed. In fact, the Proponent intends on including these and other potential habitat locations into an area to be managed for conservation in perpetuity under a Property Vegetation Plan which will form a component of a BOS (BOS).
reduce the area of occupancy of an important population, or	Yes, as above. Although habitat on Hill 1 will be lost, other habitat suitable for the Pink-tailed Worm Lizard will be created as part of the BOS.
fragment an existing important population into two or more populations, or	No. the Whole population on Hill 1 will be removed.
adversely affect habitat critical5 to the survival of a species, or	Habitat critical to this species has not been declared, however it is likely that trachye hills with suitable grassy and rock cover are critical to the species survival.

[5] Habitat critical to the survival of a species refers to:

habitat identified in a recovery plan for the species as habitat critical for those species or communities./or

Vulnerable Species Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:	**Pink-tailed Worm-lizard (V) EPBC Act 1999.**
disrupt the breeding cycle of a population, or	Possible.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or	Although habitat on Hill 1 will be removed, further habitat will be created to assist in the connectivity of existing populations and existing habitat for the Pink-tailed Worm Lizard.
result in invasive species that are harmful to a vulnerable species becoming established in the species habitat, or	Invasive species that are harmful to the Pink-tailed Worm Lizard have already become established in the DZP Site (e.g. pigs uprooting rocks). Invasive animal management is a component of the BOS and once implemented will substantially improve the current situation.
interferes substantially with the recovery of the species.	No. Other meta-populations of the Pink-tailed Worm Lizard will remain in the DZP Site. The Project has a significant research component attached looking at the creation of artificial habitat and facilitating the recovery of this species.
Conclusion	*Aprasia parapulchella* is the only listed EPBC Act species that has potential to be affected by the direct impacts associated with the Proposal. Although the action will result in disturbance to one component of a local population residing on Hill 1, it has been demonstrated that a much larger population exists in the surrounding area including land owned by the Proponent. Targeted field assessment to date (March 2012, September 2012) has mapped the current known extent of the local population

iii) habitat listed on the Register of Critical Habitat maintained by the Minister under the Act./or
iv) areas that are necessary:

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

APPENDIX 11: DUBBO FIELD NATURALISTS REPORT*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

DUBBO FIELD NATURALIST & CONSERVATION SOCIETY INC.

Fostering interest, knowledge and enjoyment in natural history and conservation since 1977

Alkane Resources Ltd
Second Floor 21 Church Street
DUBBO NSW 2830

ATTN: Mike Sutherland, General Manager NSW

REPORT: INSPECTION OF PROPOSED ZIRCONIA MINE SITE, TOONGI

Dear Mike,

The Dubbo Field Naturalists and Conservation Society would wishes to Alkane Resources and OzArk Consultants for hosting a site inspection of various areas of the proposed Zirconia mine site at Toongi on 24 and 25 March 2012.

Please find attached a report including a list of plant and animal species observed over the weekend.

Overall, the proposed offset areas were found to contain high condition grassy and shrubby woodland areas with several NSW Threatened species either found or likely to occur.

We look forward to hearing more about the proposal over the next year as planning progresses, particularly:

- the proposed offset areas and management to be undertaken in these areas
- the results of surveys and analysis of impacts to the Pink-tailed Worm Lizard *Aprasia parapulchella*
- measures to mitigate direct impacts of the mine on the remnant vegetation of the site; and
- measures to protect Wambangalang Creek from any discharge risks from the materials processing area.

We thank you for consideration given to the above points.

Yours sincerely,

Tim Hosking
President, DFNCS

Dubbo Field Naturalist & Conservation Society is a volunteer community organisation.
All correspondence to: The Secretary, PO Box 1171 Dubbo NSW 2830.
Or Email: contact@dubbofieldnats.org.au www.dubbofieldnats.org.au

REPORT: Dubbo Field Naturalist and Conservation Society Inspection of the Proposed Zirconia Mine site and Offset areas, Toongi, 24 and 25 March 2012.

Report by Tim Hosking, President DFN&CS.

Background:
The Dubbo Field Naturalist and Conservation Society (DFNCS) were invited to inspect the proposed mine site and offset areas as a destination our March 2012 monthly field trip.

Approximately 21 members, including Mike Sutherland of Alkane Resources attended the Sunday morning inspection. A further approx. 12 members and guests inspected the site on Saturday.

We were accompanied by ecologists from OzArk Ecological and Heritage Consultants and Dr Arthur White.

Methods:
Primarily the DFNCS members undertook:
1) opportunistic bird and other diurnal fauna species observations
2) random meander surveys for flora, particularly groundcover and shrub layer
3) targeted searches for Pink-tailed Worm Lizard *Aprasia parapulchella* individuals within suitable habitat

Assistance was also provided to the consulting ecologists in surveying and decommissioning Elliot and Hair trap transects.

Results:

1) Opportunistic bird and other diurnal fauna observations

A total of 51 bird species were recorded on the site as listed below:

COMMON NAME	SCIENTIFIC NAME	STATUS (FROM DUBBO BIRD LIST OCT 2011)
Brown Quail	*Coturnix ypsilophora*	Common, widespread. Grasslands and woodlands.
Common Bronzewing	*Phaps chalcoptera*	Common resident. Box/Ironbark forest and woodland, mallee
Brown Goshawk	*Accipter fasciatus*	Uncommon Resident. Woodlands
Nankeen Kestrel	*Falco cenchroides*	Common Resident. Grasslands, urban and cultivated land
Brown Falcon	*Falco berigora*	Common Resident. Grasslands, cultivated land
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Uncommon Resident. Woodlands and forests with Casuarina and Allocasuarina
Galah	*Cacatua roseicapilla*	Common Resident. All areas
Sulphur-crested Cockatoo	*Cacatua galerita*	Common Resident. Timbered watercourses, urban & crop land
Eastern Rosella	*Platycercus eximius*	Common Resident. Woodlands & urban areas.
Red-rumped Parrot	*Psephotus haematonotus*	Common Resident. Woodlands, parklands and urban areas
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	Uncommon Summer Migrant. Woodlands and forests
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Uncommon Summer Migrant. Box/Ironbark woodland
Laughing Kookaburra	*Dacelo novaeguineae*	Common Resident. Woodlands, riparian areas, urban areas.
White-throated Treecreeper	*Cormobates leucophaea*	Common Resident. Woodland & Forest.

Dubbo Field Naturalist & Conservation Society is a volunteer community organisation.
All correspondence to: The Secretary, PO Box 1171 Dubbo NSW 2830.
Or Email: contact@dubbofieldnats.org.au www.dubbofieldnats.org.au

COMMON NAME	SCIENTIFIC NAME	STATUS (FROM DUBBO BIRD LIST OCT 2011)
Brown Treecreeper	*Climacteris picumnus*	Uncommon Resident. Riparian areas, Box Woodland. Becoming increasingly hard to find away from rivers.
Superb Fairy-wren	*Malurus cyaneus*	Common Resident. Shrubby understorey in woodland and urban areas
Speckled Warbler	*Chthonicola sagittata*	Uncommon Resident. Primarily grassy Cypress/Box/Ironbark Woodlands.
Weebill	*Smicrornis brevirostris*	Common Resident. Woodlands.
Western Gerygone	*Gerygone fusca*	Common Resident. Woodlands.
Yellow Thornbill	*Acanthiza nana*	Common Resident. Woodlands and urban areas.
Buff-rumped Thornbill	*Acanthiza reguloides*	Common Resident. Woodlands.
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Common Resident. Woodlands, urban areas and parklands.
Spotted Pardalote	*Pardalotus punctatus*	Common Resident. Woodland.
Striated Pardalote	*Pardalotus striatus*	Common Resident. Woodlands.
Yellow-faced Honeyeater	*Lichenostomus chrysops*	Common Resident. Woodlands.
White-eared Honeyeater	*Lichenostomus leucotis*	Common Resident. Areas of dense shrubby woodlands.
White-plumed Honeyeater	*Lichenostomus penicillatus*	Common Resident. Urban areas, woodlands and timbered watercourses
Noisy Miner	*Manorina melanocephala*	Common Resident. Open Woodlands and gardens.
Yellow-throated Miner	*Manorina flavigula*	Common Resident. Open Woodlands and gardens.
Blue-faced Honeyeater	*Entomyzon cyanotis*	Common Resident. Woodlands & urban areas
Noisy Friarbird	*Philemon corniculatus*	Common Resident. Woodlands & gardens.
Striped Honeyeater	*Plectorhyncha lanceolata*	Common Resident. Woodlands.
Grey-crowned Babbler	*Pomatostomus temporalis*	Common Resident. Woodlands, urban areas.
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Common Resident. Woodlands, urban areas.
Rufous Whistler	*Pachycephala rufiventris*	Common Resident. Woodlands.
Grey Shrike-thrush	*Colluricincla harmonica*	Common Resident. Woodlands and gardens.
Dusky Woodswallow	*Artamus cyanopterus*	Uncommon summer migrant. Woodlands and lightly timbered areas.
Pied Butcherbird	*Cracticus nigrogularis*	Common Resident. Grasslands, woodlands, parks and gardens.
Australian Magpie	*Gymnorhina tibicen*	Common Resident. Grasslands, woodlands, parks and gardens.
Grey Fantail	*Rhipidura fuliginosa*	Common Resident. Woodlands and gardens.
Willie Wagtail	*Rhipidura leucophrys*	Common Resident. Widespread all areas
Australian Raven	*Corvus coronoides*	Common Resident. Widespread all areas
Magpie-lark	*Grallina cyanoleuca*	Common Resident. Widespread all areas
White-winged Chough	*Corcorax melanorhamphos*	Common Resident. Woodlands.
Apostlebird	*Struthidea cinerea*	Common Resident. Woodlands.
Jacky Winter	*Microeca fascinans*	Uncommon Resident. Woodlands.
Red-capped Robin	*Petroica goodenovii*	Common Resident. Woodlands.
Silvereye	*Zosterops lateralis*	Common Resident. Gardens, orchards and woodlands
Tree Martin	*Hirundo nigricans*	Common Resident. Primarily woodlands near water.
Mistletoebird	*Dicaeum hirundinaceum*	Common Resident. Box/Ironbark woodlands with mistletoe.
Double-barred Finch	*Taeniopygia bichenovii*	Common resident. Woodlands, gardens and some urban areas

Dubbo Field Naturalist & Conservation Society is a volunteer community organisation.
All correspondence to: The Secretary, PO Box 1171 Dubbo NSW 2830.
Or Email: contact@dubbofieldnats.org.au www.dubbofieldnats.org.au

Other fauna species observed included:

- Red-necked Wallaby *Macropus rufogriseus*
- Eastern Bearded Dragon *Pogona barbata*
- *Gehyra* sp. (either *variegata* or *dubia*) – under rocks
- A gecko sp. - possible Tessellated Gecko (see photo) – under rock
- Assumed skin of Pink-tailed Worm Lizard *Aprasia parapulchella (see photo)*

2) Flora Species

The following flora species were recorded on the site:

ORIGIN	GROWTH FORM	FAMILY	*GENUS*	*SPECIES*	COMMON NAME
Native	Climbers	BIGNONIACEAE	*Pandorea*	*pandorana*	Wonga Wonga Vine
Native	Ferns/Fern Allies	ADIANTACEAE	*Cheilanthes*	*sieberi*	Rock Fern
Native	Forbs	APIACEAE	*Hydrocotyle*	*laxiflora*	Stinking Pennywort
Native	Forbs	ASTERACEAE	*Calotis*	*sp.*	Purple Burr Daisy
Native	Forbs	ASTERACEAE	*Cymbonotus*	*lawsonianus*	Austral Bears Ear
Native	Forbs	ASTERACEAE	*Vittadinia*	*sp.*	Fuzzweed
Native	Forbs	CAMPANULACEAE	*Wahlenbergia*	*sp.*	A bluebell
Native	Forbs	CHENOPODIACEAE	*Chenopodium*	*pumilio*	Small Crumbweed
Native	Forbs	CLUSIACEAE	*Hypericum*	*gramineum*	Small St John's Wort
Native	Forbs	CONVOLVULACEAE	*Dichondra*	*repens*	Kidney Weed
Native	Forbs	EUPHORBIACEAE	*Chamaesyce*	*drummondii*	Caustic Weed
Native	Forbs	FABACEAE (FABOIDEAE)	*Glycine*	*clandestina*	Twining Glycine
Native	Forbs	GERANIACEAE	*Geranium*	*solanderi*	Native Geranium
Native	Forbs	GOODENIACEAE	*Goodenia*	*hederacea*	Forest Goodenia
Native	Forbs	GOODENIACEAE	*Goodenia*	*pinnatifida*	Scrabbled Eggs
Native	Forbs	HALORAGACEAE	*Gonocarpus*	*elatus*	Hill Raspwort
Native	Forbs	LOBELIACEAE	*Isotoma*	*axillaris*	Showy Isotome
Native	Forbs	MALVACEAE	*Sida*	*corrugata*	Corrugated Sida
Native	Forbs	POLYGONACEAE	*Rumex*	*brownii*	Swamp Dock
Native	Forbs	SOLANACEAE	*Solanum*	*cinereum*	Narrawa Burr
Native	Grasses	POACEAE	*Aristida*	*ramosa*	Purple Wiregrass
Native	Grasses	POACEAE	*Austrostipa*	*densiflora*	Foxtail Speargrass
Native	Grasses	POACEAE	*Austrostipa*	*scabra*	Speargrass
Native	Grasses	POACEAE	*Bothriochloa*	*decipiens*	Pitted Bluegrass
Native	Grasses	POACEAE	*Chloris*	*truncata*	Windmill Grass
Native	Grasses	POACEAE	*Digitaria*	*brownii*	Cotton Panic Grass
Native	Grasses	POACEAE	*Enneapogon*	*sp*	A bottlewasher
Native	Grasses	POACEAE	*Enteropogon*	*acicularis*	Curly Windmill Grass
Native	Grasses	POACEAE	*Eragrostis*	*lacunaria*	Purple Lovegrass
Native	Grasses	POACEAE	*Eragrostis*	*brownii*	Brown's Lovegrass
Native	Grasses	POACEAE	*Microlaena*	*stipoides*	Meadow Rice-grass
Native	Grasses	POACEAE	*Panicum*	*effusum*	Hairy Panic
Native	Grasses	POACEAE	*Sporobolus*	*creber*	Rat's Tail Grass

ORIGIN	GROWTH FORM	FAMILY	*GENUS*	*SPECIES*	COMMON NAME
Native	Grasses	POACEAE	*Themeda*	*australis*	Kangaroo Grass
Native	Grasses	POACEAE	*Thyridolepis*	*mitchelliana*	Mulga Mitchell Grass
Native	Lilies	ANTHERICACEAE	*Laxmannia*	*gracilis*	Slender Wire Lily
Native	Lilies	PHORMIACEAE	*Stypandra*	*glauca*	Nodding Blue Lily
Native	Mistletoe	LORANTHACEAE	*Amyema*	*miquelii*	Box Mistletoe
Native	Sedges/Rushes	LOMANDRACEAE	*Lomandra*	*sp.*	A Mat-rush
Native	Shrubs	CHENOPODIACEAE	*Maireana*	*microphylla*	Eastern Cottonbush
Native	Shrubs	DILLENIACEAE	*Hibbertia*	*obtusifolia*	Hoary guinea flower
Native	Shrubs	FABACEAE (FABOIDEAE)	*Hardenbergia*	*violacea*	False Sarsaparilla
Native	Shrubs	FABACEAE (FABOIDEAE)	*Dillwinia*	*sericea*	Showy Parrot-pea
Native	Shrubs	FABACEAE (MIMOSOIDEAE)	*Acacia*	*decora*	Western Golden Wattle
Native	Shrubs	FABACEAE (MIMOSOIDEAE)	*Acacia*	*doratoxylon*	Currawang
Native	Shrubs	FABACEAE (MIMOSOIDEAE)	*Acacia*	*sertiformis/cremiflora?*	Round-leaved Wattle
Native	Shrubs	GOODENIACEAE	*Dampiera*	*lanceolata*	Grooved Dampiera
Native	Shrubs	SAPINDACEAE	*Dodonaea*	*boroniifolia*	Fern-leaf Hop-bush
Native	Shrubs	SAPINDACEAE	*Dodonaea*	*heteromorpha*	Maple-fruited Hop-bush
Native	Trees	CASUARINACEAE	*Allocasuarina*	*verticillata*	Drooping Sheoak
Native	Trees	CUPRESSACEAE	*Callitris*	*endlicheri*	Black Cypress Pine
Native	Trees	CUPRESSACEAE	*Callitris*	*glaucophylla*	White Cypress Pine
Native	Trees	MYRTACEAE	*Eucalyptus*	*albens*	White Box
Native	Trees	MYRTACEAE	*Eucalyptus*	*blakelyi*	Blakely's Red Gum
Native	Trees	MYRTACEAE	*Eucalyptus*	*conica*	Fuzzy Box
Native	Trees	MYRTACEAE	*Eucalyptus*	*dwyeri*	Dwyer's Red Gum
Native	Trees	MYRTACEAE	*Eucalyptus*	*macrorhyncha*	Red Stringybark
Native	Trees	MYRTACEAE	*Eucalyptus*	*melliodora*	Yellow Box
Native	Trees	STERCULIACEAE	*Brachychiton*	*populneus*	Kurrajong
Exotic	* Forbs	ASTERACEAE	*Conyza*	*bonariensis*	Flaxleaf Fleabane
Exotic	* Forbs	ASTERACEAE	*Conyza*	*sumatrensis*	Tall Fleabane
Exotic	* Forbs	ASTERACEAE	*Hypochoeris*	*radicata*	Catsear
Exotic	* Forbs	ASTERACEAE	*Tagetes*	*minuta*	Stinking Roger
Exotic	* Forbs	ASTERACEAE	*Xanthium*	*spinosum*	Bathurst Burr
Exotic	* Forbs	BORAGINACEAE	*Echium*	*plantagineum*	Paterson's Curse
Exotic	* Forbs	LAMIACEAE	*Marrubium*	*vulgare*	Horehound
Exotic	* Forbs	MYRSINACEAE	*Anagallis*	*arvensis*	Scarlet/Blue Pimpernel
Exotic	* Forbs	SCROPHULARIACEAE	*Verbascum*	*virgatum*	Twiggy Mullein
Exotic	* Forbs	SOLANACEAE	*Solanum*	*nigrum*	Blackberry Nightshade

3) Targeted searches for Pink-tailed Worm Lizard *Aprasia parapulchella*

All signs of this species was reported to consultants on the day of the survey. One photo was taken of a suspected shed skin on the Sunday survey (see photos).

This page has been intentionally left blank

APPENDIX 12: EPBC REFERRAL DOCUMENTS*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

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

EPBC Ref: 2012/6625

Mr Phillip Cameron
Senior Project Manager / Principal Ecologist
OzArk Environment & Heritage Management
PO Box 2069
DUBBO NSW 2830

Dear Mr Cameron

Decision on referral
Dubbo Zirconia Project, Toongi, NSW

Thank you for submitting a referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).This is to advise you of my decision about the proposed action, to develop a small scale open cut mine to extract ore containing the rare metals Zirconium, Niobium and Yttrium near the village of Toongi, New South Wales.

As a delegate of the Minister for Sustainability, Environment, Water, Population and Communities, I have decided that the proposed action is a controlled action and, as such, requires assessment and a decision on approval under the EPBC Act before it can proceed.

It appears that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Listed threatened species and ecological communities (sections 18 and 18A).

For example, based on the information available in the referral, the proposed action is likely to have a significant impact because:

- It will result in the clearance of habitat for the Pink tailed worm lizard (*Aprasia parapulchella*) listed as vulnerable under the EPBC Act.

Please note that this decision only relates to the potential for significant impact on the specific matters protected by the Australian Government under Chapter 2 of the EPBC Act.

I have also decided that the project will need to be assessed through accredited assessment using an environmental impact statement under Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979*.

Each assessment approach requires different levels of information and involves different steps. All levels of assessment will include a public consultation phase, *in which any third parties can comment on the proposed action.*

Details on the assessment process for the project and the responsibilities of the proponent are set out in the enclosed fact sheet. Further information is available from the department's website at http://www.environment.gov.au/epbc.

GPO Box 787 Canberra ACT 2601 • Telephone 02 6274 1111 • Facsimile 02 6274 1666
www.environment.gov.au

A copy of the document recording these decisions is enclosed.

The project manager will contact you shortly to discuss the assessment process.

I have also written to the following parties to advise them of this decision:

Person taking the action	Mr Michael Sutherland General Manager, NSW Australian Zirconia Limited
Referring party	Mr Alex Irwin Senior Environmental Consultant R.W. Corkery & Co. Pty Ltd
NSW Department of Planning and Infrastructure	Mr John Ross

If you have any questions about the referral process or this decision, please contact the project manager, Mr Mark Jenkins, by email to mark.jenkins@environment.gov.au, or telephone 02 6274 1558 and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

Mahani Taylor
Acting Assistant Secretary
South-Eastern Australia Environment Assessment Branch
4 / 1 / 2013

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

Notification of
REFERRAL DECISION AND DESIGNATED PROPONENT – controlled action
DECISION ON ASSESSMENT APPROACH – ACCREDITED ASSESSMENT
ENVIRONMENTAL IMPACT STATEMENT

Dubbo Zirconia Project, Toongi, NSW (EPBC 2012/6625)

This decision is made under section 75 and section 87 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

proposed action	The development of an open cut mine to extract ore containing the rare metals Zirconium, Niobium and Yttrium and Rare Earth Elements near the village of Toongi, New South Wales [See EPBC Act referral 2012/6625].
decision on proposed action	The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.
relevant controlling provisions	• Listed threatened species and communities (sections 18 & 18A)
designated proponent	Australian Zirconia Limited ACN: 091 489 511
assessment approach	The project will be assessed by Accredited Assessment as an Environmental Impact Statement under the *NSW Environmental Planning and Assessment Act 1979*.
Decision-maker	
Name and position	Mahani Taylor Acting Assistant Secretary Environment Assessment Branch
Signature	
date of decision	4/1/13

This page has been intentionally left blank

APPENDIX 13: PINK-TAILED WORM-LIZARD PLAN OF MANAGEMENT

Note*: A colour version of this Appendix is available on the Project CD

This page has been intentionally left blank

PLAN OF MANAGEMENT

FOR

PINK-TAILED WORM-LIZARD

APRASIA PARAPULCHELLA:

DUBBO ZIRCONIA PROJECT,

DUBBO, NSW.

April 2013

REPORT PREPARED BY
BIOSPHERE ENVIRONMENTAL CONSULTANTS P/L

ON BEHALF OF

AUSTRALIAN ZIRCONIA LTD

This page has intentionally been left blank

Table of Contents

Appendices

Figures

Tables

1.0 INTRODUCTION

1.1 Background

The Pink-tailed Worm-lizard *Aprasia parapulchella* is a small, legless lizard that occurs in scattered but discrete population along the western foothills of the Great Dividing Range, from Benalla in Victoria to Gunnedah in New South Wales (Wong *et al*. 2011). For many years the species was only known from sites along the Murrumbidgee River in the ACT but recent surveys have detected isolated populations of this secretive species across a wider range.

In 2001, a few Pink-tailed Worm-lizards were observed on Dowd's Hill to the immediate west of the proposed site of an open cut mine to be developed as part of the Dubbo Zirconia site, about 25 kilometres south of Dubbo (Goldney 2001). This was the first (and only) record of this species in the Dubbo City Local Government Area (LGA). Following a period between 2001 and 2012 during which the proponent of the Dubbo Zirconia Project (DZP), Australian Zirconia Ltd (AZL), completed further feasibility studies and project development work, additional fauna and flora surveys were commissioned. As the Pink-tailed Worm-lizard is listed as a threatened species on the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* additional targeted surveys were required in the areas of proposed impact to document the distribution and abundance of this species in and around the site of the proposed mining, processing and waste management activities (collectively referred to as the DZP Site) and to assess any impacts that might arise as a result of the DZP. In February 2012, Biosphere Environmental Consultants Pty Ltd was engaged by AZL to undertake targeted surveys for the Pink-tailed Worm-lizard with the aims of:

1. determining the distribution of the species in the areas to be impacted by the DZP, and

2. to determine if the species occurs elsewhere in the immediate vicinity of the proposed impact footprint that could be conserved.

As a result of those surveys, Pink-tailed Worm-lizards were found in additional 30 sites (refer to Section 2.3). The distribution of the species in the Toongi area is now much better understood as is the relative size of the local population.

The proposed mining, processing, waste management operations and the associated infrastructure of the DZP (Figure 3) will impinge on habitat that is occupied by the Pink-tailed Worm-lizard and it is the focus of this Plan of Management (PoM) to consider the extent of that impact and to propose suitable amelioration measures that will assist with the ongoing conservation of this reptile on the DZP Site and in the local area.

1.2 Project Location and Local Setting

The DZP Site is located about 25 kilometres south of Dubbo in the central west of New South Wales (Figure 1).

The DZP Site is centred on six agricultural properties adjacent to the village of Toongi on the now disused Dubbo – Molong Rail Line. Significant vegetation clearing has been undertaken on these properties as part of rotational cropping and grazing activities, however, a large remnant of native vegetation is present on Dowd's Hill on the eastern side of the DZP Site. Some remnant vegetation also remains on the elevated hill tops and ridges which generally indicate the underlying trachyte geological formation.

The village of Toongi includes four residential dwellings, historic grain loading infrastructure to the rail line and some grazing activities on Crown Land. Other notable features of the local setting include Paddy's Creek and Wambangalang Creek to the west of the DZP Site, Cockabroo Creek to the south and the Macquarie River approximately 7km to the north and northeast of the DZP Site.

Figure 2 provides an aerial photograph of the DZP Site illustrating the features of the local setting noted above.

1.3 Description of the Proposal

The DZP would comprise a small scale open cut mine supplying ore containing rare metals, zirconium and niobium, and rare earth elements (REE's), including hafnium and tantalum, to a unique and purpose developed processing plant near the village of Toongi (see Figure 3). The following provides an overview of principal components and activities to be undertaken on the DZP Site (and illustrated on Figure 3).

- Extraction of approximately 19.5Mt of ore at a maximum rate of 1.1Mt per year over approximately 20 to 22 years from a shallow open cut developed to a maximum depth of 32m (355m AHD) (remaining above the groundwater table).
- Extraction and placement of approximately 3.5Mt of waste rock within a small waste rock emplacement (WRE) to the southwest of the open cut.
- Haulage of ore to a Run-of-Mine (ROM) Pad for crushing and grinding.
- Processing of the crushed and ground ore by:
  - Sulphation roast of ore and leaching to dissolve sulphated metals.
  - Solvent extraction, precipitation, thickening, washing and drying of the various rare metal and REE products.

  The sulphuric acid required as part of the sulphation process would be manufactured within the DZP processing plant from imported raw sulphur.

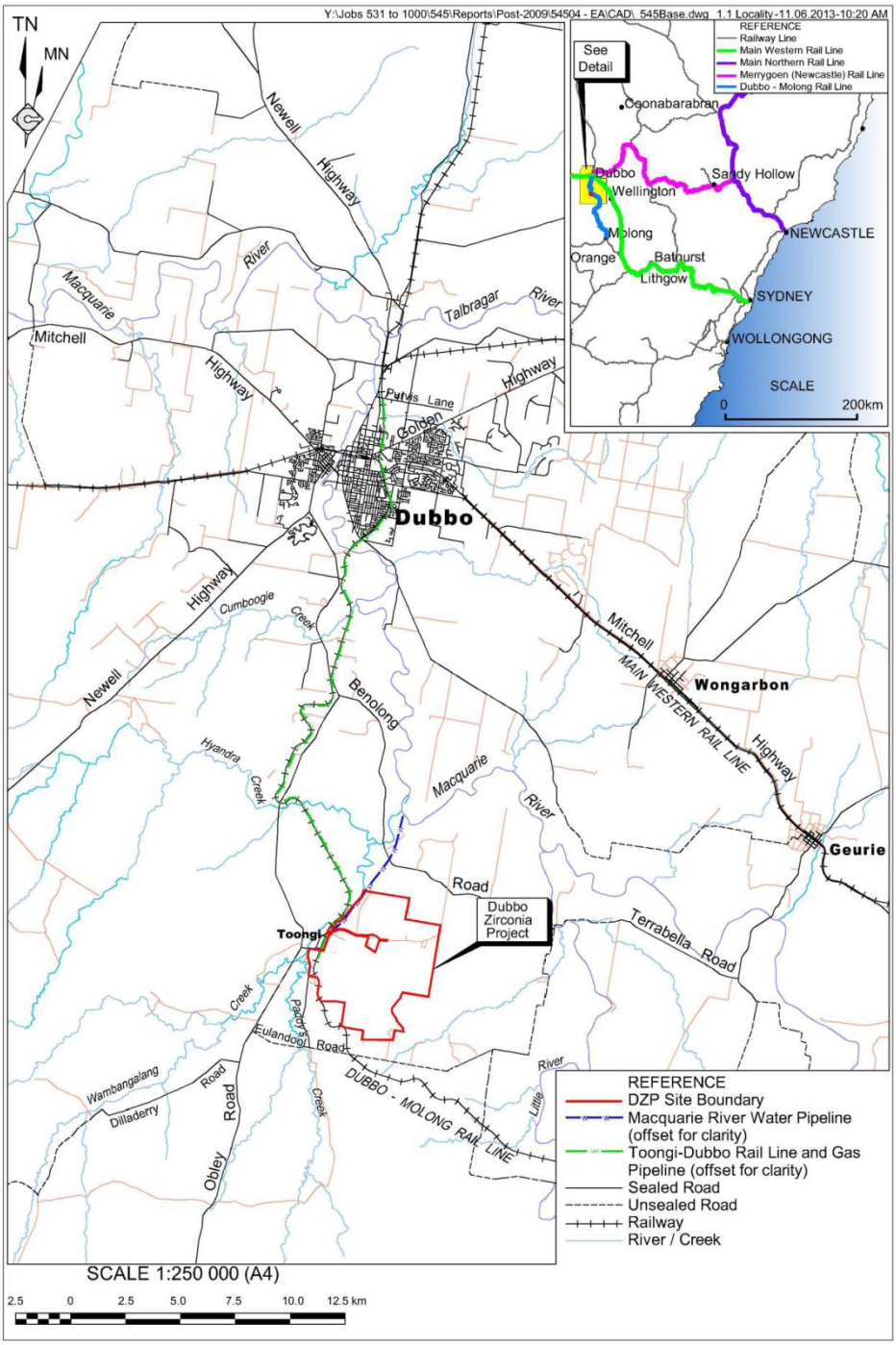


Figure 1 Location of Project Area

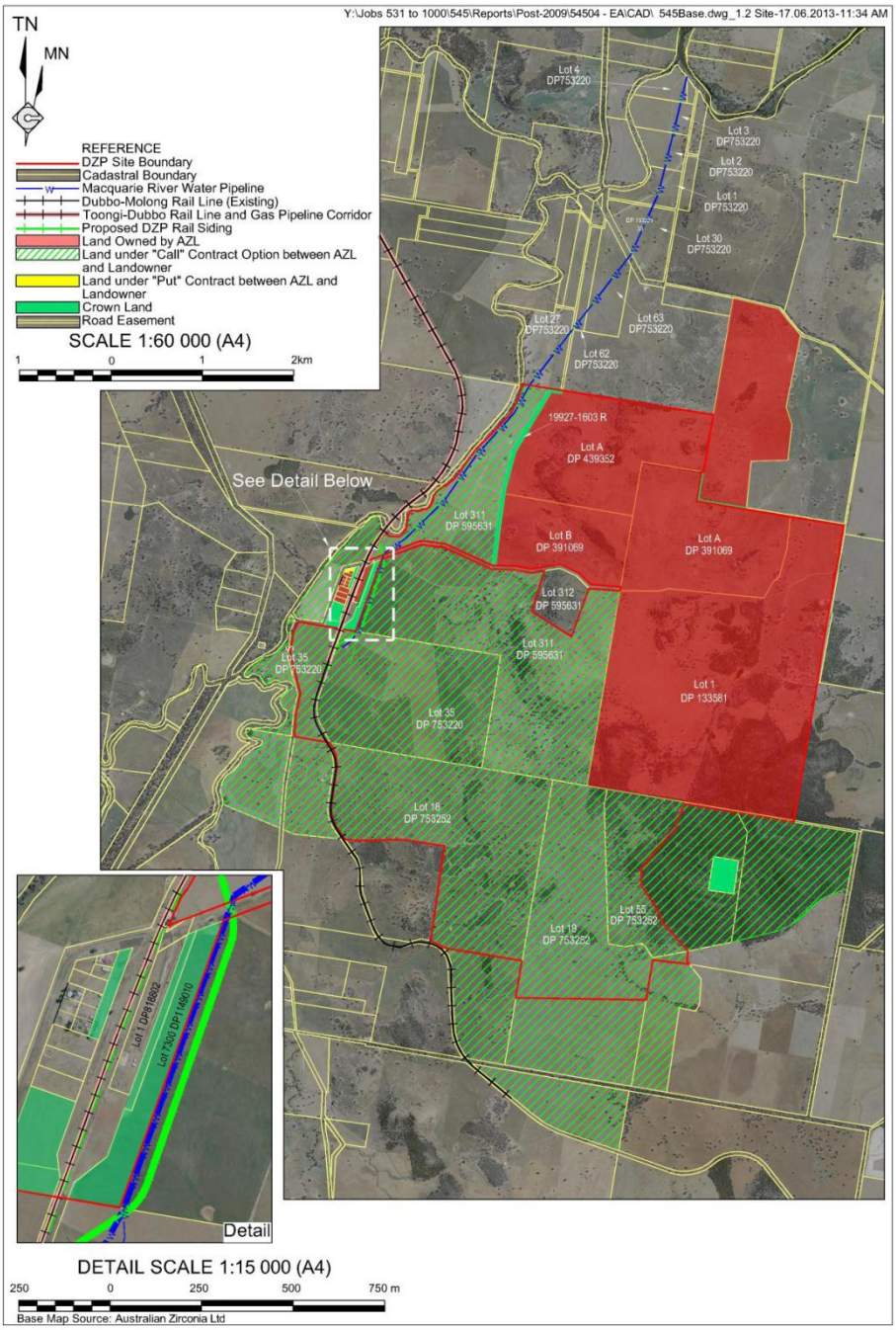


Figure 2 Local Setting

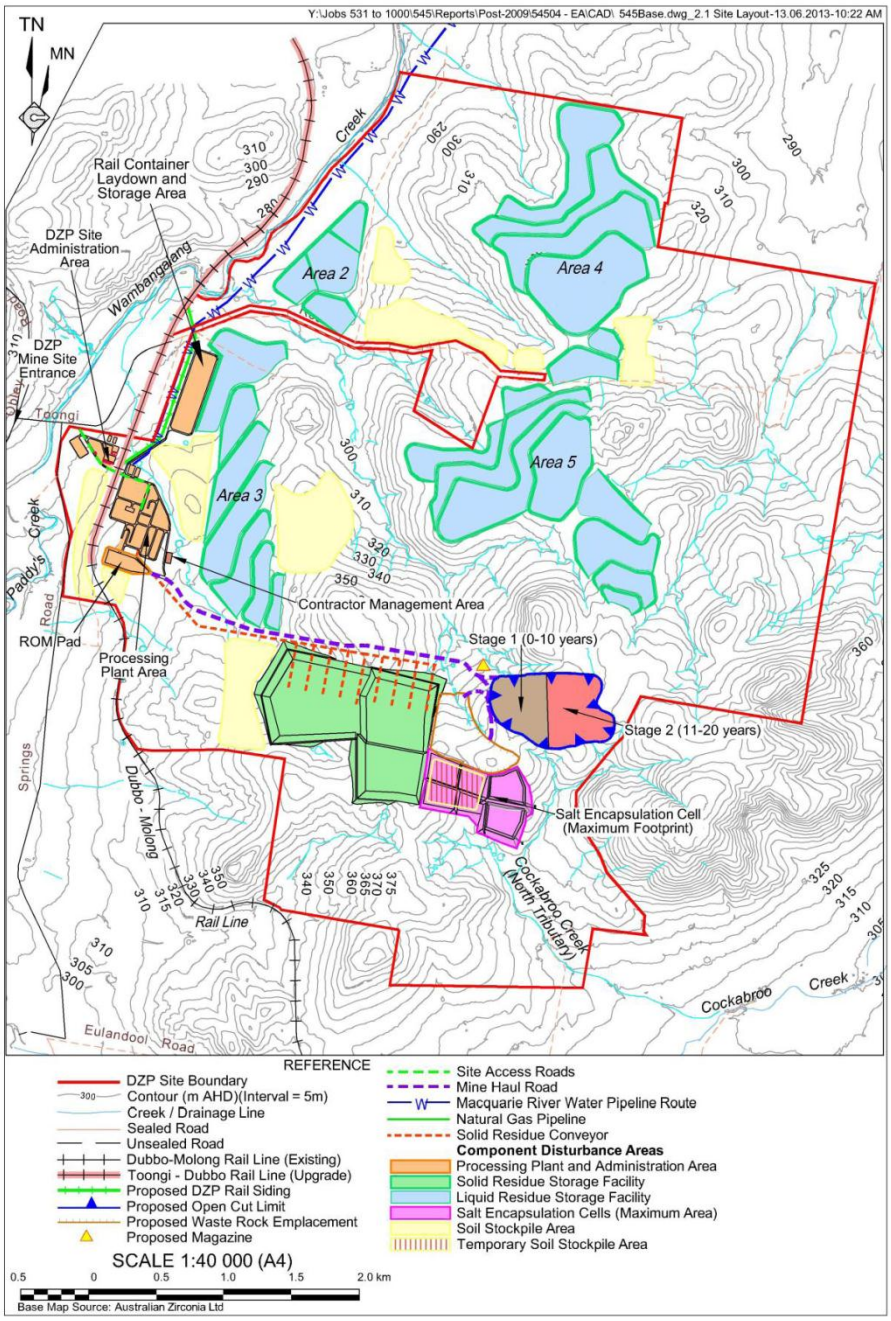


Figure 3 DZP Site Layout

- Construction and operation of a rail siding from the Toongi-Dubbo Rail Line and a Rail Container Laydown and Storage Area for the unloading and temporary storage of reagents and loading of products for despatch.

  Other reagents would be transported to the DZP Site via the public road network, with sections of Obley Road and Toongi Road to be upgraded to accommodate the proposed increase in heavy vehicle traffic.
- Mixing of solid residues produced by the processing of the ore with crushed and washed limestone and transportation via conveyor to a Solid Residue Storage Facility (SRSF).
- Pumping of water used in the processing operations, which cannot be recycled, to a Liquid Residue Storage Facility (LRSF), comprising a series of terraced and lined crystallisation cells.
- Recovery and disposal of an estimated 6.7Mt of salt which would accumulate within the LSRF within a series of Salt Encapsulation Cells adjoining the WRE and SRSF.
- Other ancillary activities including equipment maintenance, clearing and stripping of the areas to be disturbed and rehabilitation activities.

Table 1 provides the areas of disturbance attributable to each area of disturbance.

Table 1 Areas of Disturbance

Component Area	Disturbance (ha)
Open Cut	40.3
Waste Rock Emplacement	20.4
Processing Plant	43.3
ROM Pad	4.2
Solid Residue Storage Facility	102.8
Liquid Residue Storage Facility[1]	425.4
Salt Encapsulation Cells	34.6
Internal Haul Road	7.3
Total	**807.7**
Note 1: Disturbance area of LRSF includes evaporative surface area and embankments	

A further 129.4ha has been identified as potential soil stockpiling areas1.

The ore body to be mined is a roughly elliptical stock in shape with outcrop dimension of 600m x 400m. Exploration completed by AZL has identified the ore body extends below a thin veneer of soil and recent sediments to be

[1] This area is greater than is likely to be required for soil stockpiling but will provide greater flexibility as to where stripped soil is to be stored over the life of the Proposal.

approximately 900m (east-west) x 500m (north-south) (surface area of 360 000m2) and appears to be a near vertical body of indeterminate depth.

While there is limited scope to modify the area of impact associated with the open cut, in order to minimise the impact of the mining operations, however, AZL has designed the mining sequence such that the initial 10 year mine plan develops the western half of the open cut with the eastern half developed and mined during the second 10 year mining period. The relevance of this mining sequence to the management of impacts on the Pink-tailed Worm-lizard is discussed later in this PoM.

The size and location of the other components of the DZP Site have been the subject of more detailed review, with impact minimisation a key consideration. In particular, avoiding impacts on areas of remnant native vegetation and areas of known or potential Pink-tailed Worm-lizard habitat (discussed in Section 5 of this report) was identified as an objective.

1.4 Plan of Management: Objectives

This PoM was prepared to ensure that the Pink-tailed Worm-lizards continue to survive and thrive at Toongi, and to minimise the disturbance to the local population as a result of the Proposal.

2. BIOLOGY OF THE PINK-TAILED WORM-LIZARD

2.1 Description

The Pink-tailed Worm-lizard (**Figure 4**) is a member of the family Pygopodidae (flap-footed or legless lizards). Like its congeners, the Pink-tailed Worm-lizard is a small worm-like, burrowing legless lizard with poorly-developed hind-limb flaps. The snout and the tail are rounded and blunt, and it can grow to 14 cm (snout – vent length). The dark brown head and nape gradually merge with the pale grey or grey-brown body. Body colour changes to pinkish/reddish-brown toward the end half of its tail, and the longitudinal dark bar within each dorsal scale gives the impression of lines of dots along the body and tail. It is whitish below, with a rounded blunt snout and no ear opening, and its tail is nearly as long as its body (Cogger 2000). The Pink-tailed Worm-lizard is a dietary specialist, consuming adults, larvae and pupae of at least five species of small ants (Jones 1992). The Pink-tailed Worm-lizard exhibits sexual dimorphism, with females attaining longer snout-vent lengths (SVL) than males (Jones 1999). Females are oviparous with a clutch size of two (Osborne and Jones 1995).

2.2 Distribution of the Pink-Tailed Worm Lizard

The known distribution of the Pink-tailed Worm-lizard has changed dramatically over the last twenty years. For many years the species was only known from the ACT and nearby parts of NSW in areas of open grassland. However, field surveys for threatened reptiles have located this species in new habitats in areas quite distant from the ACT and nearby areas.

The Pink-tailed Worm-lizard is now known to be patchily distributed across sloping woodland areas of the western foothills of the Great Dividing Range in south-eastern Australia, where it is typically associated with abundant surface rock, including granite, basalt and sandstone outcrops (Australian National University 2009; DECC 2007; DEWHA 2009; Jones 1992; Osborne *et al.* 1991; Robertson and Heard 2008).

In Victoria, it has only been found in the general Bendigo area, though its occurrence in woodland environments in south-central New South Wales, including Albury, and the Australian Capital Territory suggests that it may occur elsewhere in Victoria (Brown 2009). To date, records of this worm-lizard have been collected from the Gunnedah, Bathurst, Tarcutta, West Wyalong, Walbundrie, Howlong, Holbrook and Albury localities of New South Wales, the general Canberra area in the Australian Capital Territory, and the general Bendigo area of central Victoria (Atlas of Victorian Wildlife, DSE; Michael & Herring 2005; Osborne & Jones 1995; Osborne *et al.* 1991; Osborne & McKergow 1993; Robertson and Heard 2008).

Until 2000 it was only known from the southern tablelands region of NSW to Bendigo in Victoria. Since then it has been recorded in the Goulburn River National Park in 2000 and 5 km north east of Bathurst in 2002.

Figure 4 Adult *Aprasia parapulchella*

The first *Aprasia parapulchella* recorded in the Namoi catchment was found by Ray Williams (Ecologist, Ecotone Pty Ltd) at Gunnedah in September 2006 where it was found in a multilayered immature woodland/low open forest on a rocky conglomerate ridge adjoining the southern outskirts of the town. Within the Namoi catchment, the Pink-tailed Worm-lizard was recorded in only one location near Gunnedah (Figure 5). The Gunnedah records are a large range extension for the species, some 100 km north of the previous limit at Wollar in the Goulburn River National Park.

In 2001, Goldney found the first example of the Pink-tailed Worm-lizard near Toongi, about 25 kilometres south of Dubbo. Subsequent surveys by White (2012, 2013) have demonstrated that this population is larger than any others so far identified in NSW and occurs across a number of sites.

The Toongi (Dubbo) population is one of only two known to be present in the Central West CMA, the other population being near Bathurst.

Figure 5 depicts the known distribution of the Pink-tailed Worm-lizard in New South Wales, ACT and Victoria.

2.3 Distribution of The Pink-Tailed Worm-Lizard In The Local Area

Targeted surveys for the Pink-tailed Worm-lizard commenced in April 2012 and have continued into 2013 (White 2012, 2013). The aim of these surveys was to assess the distribution and abundance of these reptiles within the DZP site.

The surveys comprised hand searches of potential habitat where potential habitat areas comprised sites where the underlying lithology was alkaline volcanic rocks and loose, surface rocks were readily available. Some searches were made in areas of exposed sandstone but these were abandoned as no lizards were found in areas with this lithology.

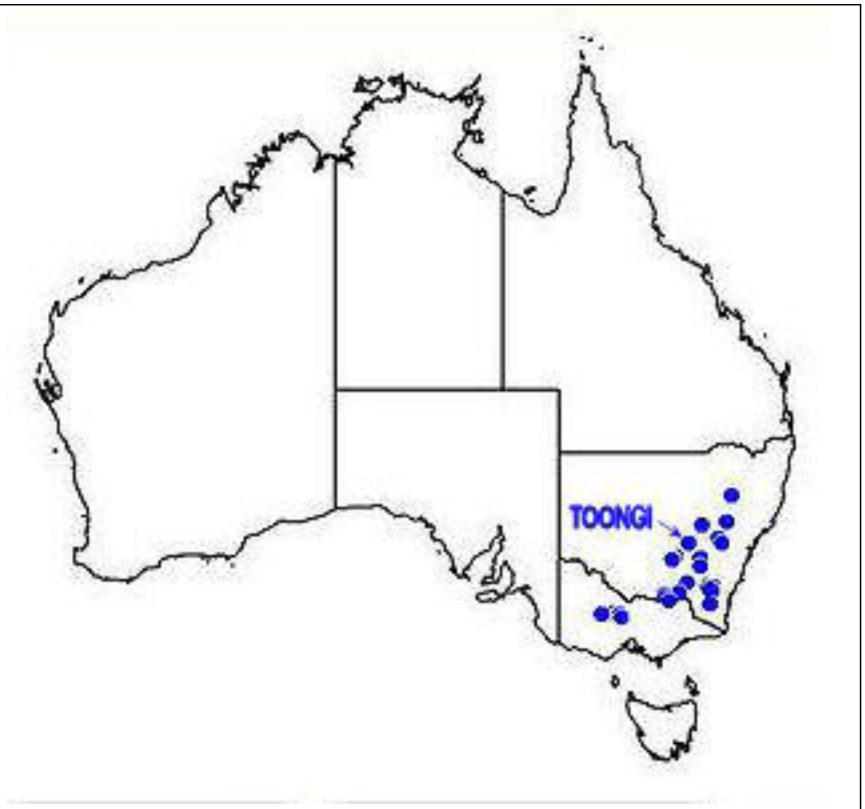


Figure 5 Distribution of the Pink-tailed worm-Lizard in New South Wales, ACT and Victoria

Each survey area was systematically searched by Dr White (assisted by ecologists from OzArk Environment and Heritage Management Pty Ltd [OzArk] and volunteers from the Dubbo Field Naturalist Group) with all loose rocks upended and a record kept of the animals found beneath each. If Pink-tailed Worm-lizards were found, they were caught (if possible) and measured before being released at the site of capture. The rock was duly marked so that the site could be readily re-found and the GPS co-ordinates of the site were also recorded. If shed skins of the Pink-tailed Worm-lizards were found, these were also measured so that the size of the host animal could be determined.

To date, Pink-tailed Worm-lizards have been found in 30 sites in or within 5 kilometres of the DZP Site. In each case the recorded location occurs over or adjacent to weathered trachyte outcrop, referenced to Habitat Areas[2] 1, 2, 3, 4 or 6 (**Figure 6**).

[2] The Habitat Areas have been further sub-divided (referenced by a-e) on the basis of conditions influencing the 'quality of the habitat (refer to Section 3.5).

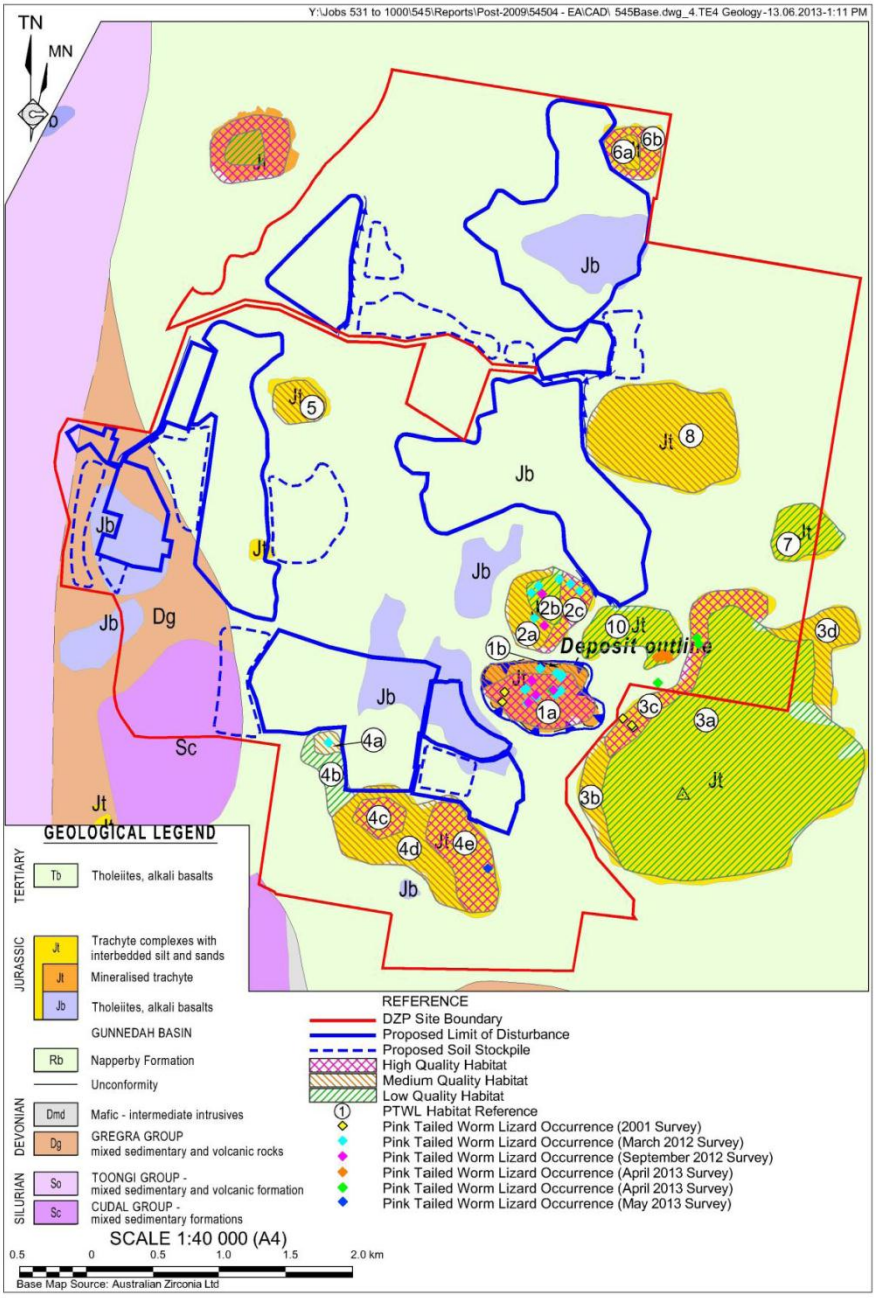


Figure 6 Location of the PTWL on the DZP Site and Underlying geology.

Most lizards are found in areas around the base of the outcrops where exfoliated slabs of trachytes lie loosely scattered across open woodland or grassland (**Figure 7**).

Additional surveys are planned for the future so that all of the trachyte-dominated landscapes within a 15 kilometre radius can be assessed (pending access).

Figure 7 Typical Surface Rocks that provide shelter habitat for the Pink-tailed Worm-lizard

2.4 Conservation Status

The current conservation status of the Pink-tailed Worm-lizard, *Aprasia parapulchella*, under State and Commonwealth legislation is as follows:

- **Vulnerable** under the *NSW Threatened Species Conservation Act 1995 (NSW)*.
- **Vulnerable** under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

2.5 Habitat Requirements

The preferred habitat for the Pink-tailed Worm-lizard is open vegetation with a sunny aspect, not facing south (Osborne and McKergow 1993). In addition, this species prefers sites that have not been heavily grazed and have shallow, surface rocks that receive some direct sunlight, since they are used for thermoregulation (Australian National University 2009). The rocks may be

small, flat-based rocks and are most often of volcanic origin (Osborne & Jones 1995).

The Pink-tailed Worm-lizard is most abundant in areas which have not been pasture-improved and that retain a moderate to extensive cover of native grasses, especially Kangaroo Grass *Themeda triandra* (Osborne and Jones 1995).

In the ACT, native grasses, loose or partially embedded surface rock, and colonies of ants of the genus *Iridiomyrmex*, (which provide both a food source and tunnels for shelter) are regarded as critical habitat components (DECC 2007; Jones 1992; Michael and Herring 2005; Osborne *et al*. 1991; Robertson and Heard 2008; Wilson and Swan 2008).

For reasons that are not clear, Pink-tailed Worm-lizards are most commonly found sheltering under small rocks (150-600 mm basal area) that are shallowly embedded in the soil (2-5 cm). Very few individuals have been found under larger rocks or rocks more deeply embedded in the soil (Barrer 1992).

Most of the sites where the Pink-tailed Worm-lizards have been found are relatively flat or have only a low slope (Barrer 1992).

The lizards utilise ant burrows underneath rocks, possibly retreating deep into burrows in hot, dry weather (Osborne and Jones 1995). It is clear that a high abundance of invertebrates under rocks seems to be essential to their occurrence (Barrer 1992).

Pink-tailed Worm-lizards have been collected from a few grassland sites that appear not to support any native grasses. Several animals have been found on the edge of *Callitris endlicheri* woodland and *Eucalyptus macrorhyncha* woodland (Barrer 1992). Pink-tailed Worm-lizards have also been found in low densities in relatively open areas in *Casuarina stricta* stands with a *Themeda* sp. understorey, and *in Kunzea ericoides* scrub (Barrer 1992; Osborne and McKergow 1993).

Habitat analysis of know Pink-tailed Worm-lizard sites in the ACT has revealed that the underlying lithology of the area has a strong influence on the presence of these reptiles. These reptiles have only once been found under sandstone (W. Osborne pers comm.) and on a few occasions under loose pieces of Ordovician shales. Of the volcanic rocks investigated, Pink-tailed Worm-lizards have occasionally been found under granites but by far the most common rock type that they are associated with are intermediate volcanic (typically alkaline trachytes).

2.6 Threats

A number of significant threats to the Pink-tailed Worm-lizard have been identified by Osborne and Jones (1995).

- Habitat loss and fragmentation as land is cleared for residential, agricultural and industrial developments.

- Removal of surface rocks.
- Heavy grazing and trampling by stock and rabbits, causing habitat degradation through root damage, prevention of seedling establishment and erosion.
- Invasion of habitat by weeds or escaped pasture species that degrade habitat.
- Habitat degradation through slashing for hazard reduction, ploughing and rock removal.
- Modification of habitat through tree-planting in native grasslands.
- Changed fire regimes that result in changes to vegetation structure and composition.

3. PINK-TAILED WORM-LIZARD HABITAT OF THE STUDY AREA

3.1 Regional Setting

The DZP Site contains an area of approximately 2 500ha, approximately 25 kilometres south of Dubbo in New South Wales (**Figure 1**). Approximately 80% of the DZP Site is agricultural land that has been used either for cattle grazing or sowing, most of which is either regularly cultivated, or has been cultivated at some point in the recent past. As a consequence, the majority of the site consists of cleared land with only the rocky outcrops or areas alongside watercourses that have any tree cover. The largest area of continuous vegetation cover is Dowd's Hill (Habitat Area 3) where there is a large stand of Black Cypress Pine covering the slopes and crown of the hill (**Figure 8**). Cypress Pine woodland also dominates the slopes of the other trachytes exposures.

The watercourses that cross the large open field across the DZP Site are lined with Tumbledown Red Gum or Fuzzy Box or Inland Grey Box (see **Figure 8**).

There are several farm dams within the study area and the site is cross-crossed by station tracks and paddock fence lines.

3.2 Vegetation Communities

OzArk EHM has mapped six broad vegetation types (BVT) (with prefix CW) and an additional three vegetation communities not equivalent to any BVT within the DZP Site (**Figure 8**).

- CW 112: Blakely's Red Gum – Yellow Box grassy woodland of NSW South Western Slopes Bioregion (Benson 277).
- CW 121: Bulloak – White Cypress Pine woodland mainly in te NSW South Western Slopes Bioregion (Benson 54).
- CW 138: Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201).
- CW 143: Heathy Shrublands on rocky outcrops of the western slopes.
- CW 212. White Box - Tumbledown Gum woodland on fine-grained sediments on the NSW central western slopes (Benson 270).
- CW 213. White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267).
- Cleared / grazed / crop.
- Derived Grassland, Grazing Country with Scattered Tress and Tree Clumps.
- White Cypress Pine Monocultures.

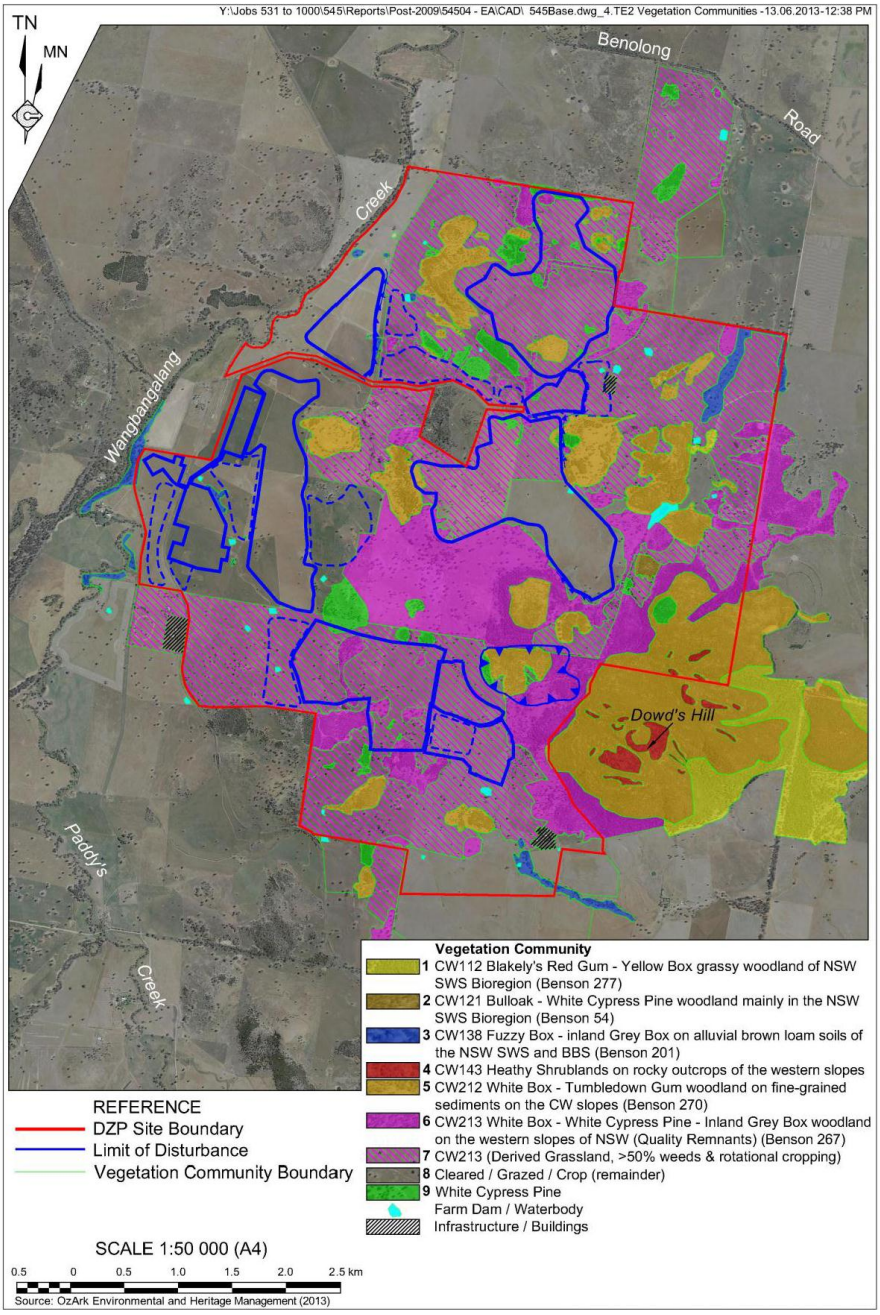


Figure 8 Vegetation Communities of the DZP Site

3.3 Geology and Soil Types

Studies on the Pink-tailed Worm-lizard have found that there is a strong association between the presence of these animals and the underlying substrate (Osborne and Jones 1995). In the ACT, the Pink-tailed Worm-lizard is most often found in area of exposed alkaline, intermediate volcanic rocks, rarely on granites and almost never in sedimentary or metamorphic areas. At the DZP Site, trachyte intrusions are exposed in several locations and have weathered to produce local alkaline soils. **Figure 6** depicts the distribution of the trachytes and **Figure 9** presents the soil landscape units of the DZP Site (SSM, 2013).

The close proximity of the trachytes domes has resulted in overlapping series of trachyte-derived soils (of the Belowrie Soil Landscape Unit) that link Hills 1, 2, 3 and 4. It is evident from the locations where the Pink-tailed Worm-lizard have been found that there is a very strong correlation between the presence of the Pink-tailed Worm-lizard, the trachytes exposures (**Figure 6**) and associated the alkaline soils around the perimeter of these exposures (Figure 9).

3.4 Ant Surveys

Pink-tailed Worm-lizards are dependent on small ants as prey. As a further test of the suitability of the soils around the trachytes exposures ant surveys were conducted by EcoBiological in late 2013 (see **Appendix A**). Twenty three ant species were found at the seven survey sites chosen and ant abundances were high at all seven sites. All of the ants present were ground-dwelling foragers feeding on a wide range of plant and animal material. All species were colonial and each could be a potential food source for the Pink-tailed Worm-lizard.

All sites chosen were sites where the Pink-tailed Worm-lizard had previously been found. Ant diversity and abundance was high in all areas.

The ant surveys revealed that there was a high availability of potential prey items in the immediate area, including an area of proposed habitat enhancement (see Section 5.3). This further supports the likelihood that the areas of habitat enhancement proposed as a management method for the protection and conservation of the Pink-tailed Worm-lizard (see Section 5.3) either already contains or will be quickly colonised by ants and other invertebrates providing a prey source for the Pink-tailed Worm-lizards to allow for colonisation of these enhanced sites.

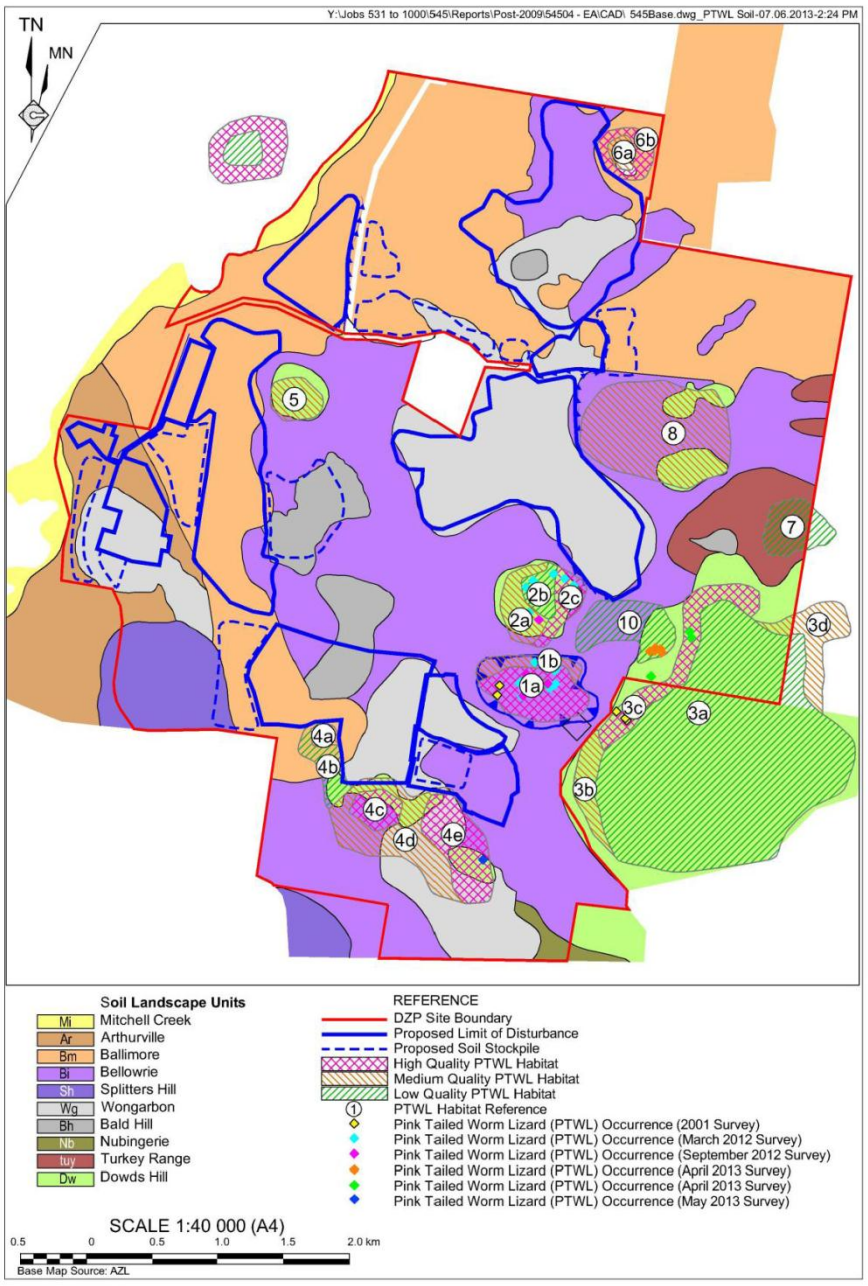


Figure 9 Soil Landscape Units of the DZP Site

3.5 Habitat Availability on the DZP Site, Assessment and Evaluation

The DZP Site is dominated by a number of trachyte intrusions (referred to as Habitat Areas 1 to 4) (**Figure 6**). The land between these intrusions is either derived from Jurassic age alkaline basaltic (igneous) rock over an underlying Triassic sandstone lithology. Grassland and open woodland predominate across the DZP Site and it is only locations such as Dowd's Hill (Habitat Area 3) that is covered by closed woodland (**Figure 8**).

On the basis of the known habitat requirements and preferences of the Pink-tailed Worm-lizard described previously, the DZP Site contains a high proportion of potential habitat for the Pink-tailed Worm-lizard.

Dr Gilbert Whyte (EcoBiological 2013, **Appendix A**) generated a habitat assessment regime when conducting ant surveys on the site. EcoBiological (2013) referenced the following main features known to influence the occurrence of the Pink-tailed Worm-lizard, assigning a weighting based on relative importance, in order to assess the quality of habitat.

Using these measures to assess the quality of the habitat at the seven sites surveyed for ants, Ecobiological (2013) was able to score each site and rate it as containing high or moderate quality habitat.

The habitat assessment method used by EcoBiological (2013) was subsequently reviewed and modified for application over larger areas of potential habitat[3]. On the basis of these modifications, the habitat assessment scoring scheme was generated as follows.

- Record of Presence (/5).
- Slope aspect (/1).
- Soil type (/2).
- Canopy openness (/3).
- Diversity of grassy groundcover (/3).
- Presence of surface rocks (/5).
- Underlying geology (/5).
- Ant abundance (/1).

---

[3] The main modifications to the habitat assessment scoring system are as follows.

- The weighting assigned to 'record of presence' was reduced to (/5) as this was considered to artificially elevate marginal habitat areas simply on the basis of a single record (live animal or skin).
- The weighting assigned to surface rocks was increased to (/5) as this is considered a key indicator in the likely occurrence of the species (possibly due to these providing ideal microclimates for ant nests).
- An additional measure, underlying geology, was included as both the literature and on-site recordings confirm this as a key indicator.
- The weighting and method of measure of ant abundance was reduced (/1) and modified (to reflect presence of absence. This was done as there is not sufficient data across the entire site on ant abundance and it is likely that the key habitat features for the Pink-tailed worm-lizard are likely to be equivalent to those likely for elevated ant abundance.

Table 2 provides the updated habitat assessment scoring scheme and weighted criteria that will be used in all future habitat assessment.

- High quality habitat is assigned when the combined score is 20 or above.
- Medium quality habitat is assigned when the combined score is 14 to 19.
- Low quality habitat is assigned when the combined score is 8 to 13.
- Scores lower than 8 are not considered as providing suitable habitat.

The assignment of high, moderate and low quality habitat was 'truthed' by completing a score card for areas considered to high, medium and low quality habitat on the basis of field inspection. Good correlation between the scoring system and field assessment was gained.

Figure 6 identifies the extent of potential habitat for the Pink-tailed Worm-lizard on the DZP Site following application of the habitat assessment scoring scheme. The existing habitat areas are tightly restricted to the trachyte outcrops because of the lack of surface rocks away from these sites. Individual score cards for each distinct area of high, medium and low quality habitat are included as **Appendix B**.

Based on the habitat identification, assessment and evaluation methodology described in this section, Pink-tailed Worm-lizard habitat has been mapped on the DZP Site and immediate surrounds as follows (see **Figure 6**).

- 107.8ha of high quality habitat.
- 179.2ha of medium quality habitat.
- 367.3ha of low quality habitat.

Table 2 Habitat Assessment

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		/1
	Well-Draining Soil	Sandy Loam = 2	/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	/1
		Ant nests present = 1	
		Total	**/25**

Note 1: Suitable surface rocks are those roughly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurrence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

4.0 POTENTIAL IMPACTS ON THE PINK-TAILED WORM-LIZARD ARISING FROM THE PROJECT

The Environmental Impact Statement (EIS) for the Dubbo Zirconia Project (Corkery 2013) identifies that impacts will occur on the habitat of the Pink-tailed Worm-lizard. These impacts will occur because the species is so widely dispersed across the DZP Site and, despite efforts to avoid the habitat areas when possible, some habitat areas occur where impact cannot be avoided, e.g. over the trachyte ore body to be mined on Habitat Area 1.

4.1 Potential Impacts Arising during the Creation and Establishment of the Mine

The greatest impact on the Pink-tailed Worm-lizards will be the loss of habitat over the area associated with the development of the open cut on Habitat Area 1. In order to develop and mine the open cut, and construct and operate haul roads and utility service easements, the clearance of vegetation and surface rocks will be required.

The development of various other structures on the DZP Site including a waste rock emplacement, Liquid Residue Storage Facility, Solid Residue Storage Facility and Salt Encapsulation Cells will also impact on areas of Pink-tailed Worm-lizard habitat.

On the basis of the mapped Pink-tailed Worm-lizard habitat (see **Figure 6**), and the proposed impact footprint of the DZP, the impact would be as follows.

- 25.5ha of high quality habitat.
- 9.8ha of medium quality habitat.

It is noted that the majority of this disturbance occurs over the proposed open cut site and that approximately 50% of this would not be impacted for at least 10 years (based on a staged open cut development plan – see also **Figure 3** and Section 5.2).

4.2 Potential Impacts Arising during the Operation of the Site

Once the mine if fully operational, it is not envisioned that there will be further impacts or loss of potential habitat of the Pink-tailed Worm-lizard.

5.0 CONSERVATION MEASURES FOR THE PINK-TAILED WORM-LIZARD ON SITE

5.1 General Principles

The aim of this PoM is to ensure that the population of Pink-tailed Worm-lizards that occur on the DZP Site remain there and continue to be a viable population regardless of the presence or operation of the DZP. To this end, the PoM sets out the measures to be implemented to avoid disruption to existing areas of Pink-tailed Worm-lizard habitat as much as possible. Secondly, where habitat areas are likely to be disrupted or lost, equivalent or greater areas of habitat will be created or enhanced close by.

Habitat creation areas will be chosen primarily according to two factors, location and availability of habitat factors associated with existing populations of the species (see Section 3.5), i.e. areas that have the correct underlying geology, suitable vegetation and are in close proximity to existing Pink-tailed Worm-lizard habitat will be selected. In implementing these criterion, created habitat areas will be developed to fill in gaps between existing habitat areas and thus create habitat corridors between otherwise disconnected areas.

5.2 Avoidance of Pink-tailed Worm-lizard Habitat Areas

Surveys carried out in 2012 and 2013 (White 2012, 2013), and subsequent assessment and evaluation of various factors influencing the occurrence of the species (Section 3.5), have identified Pink-tailed Worm-lizard habitat areas on the DZP Site (**Figure 6**). Having identified these areas, the original planning footprint for the open cut and associated infrastructure was overlain and areas of conflict were identified. The two major impact areas identified were the open cut and residue storage facilities (both solid and liquid).

There is limited scope to relocate the open cut (based on the boundary of the ore body), however, AZL has committed to developing the open cut in two stages such that only half of the open cut is impacted during the initial ten years of the Proposal. Using this approach it will be possible to collect Pink-tailed Worm-lizards from the impact area and relocate these animals to nearby know habitat areas. It also allows for created habitat areas to be developed between the open cut area and existing habitat areas to facilitate the passive transfer of lizards away from the open cut impact area.

Conflict between Pink-tailed Worm-lizard habitat confirmed on Habitat Areas 2, 3, 4 and 6 and initially proposed residue storage facilities was reviewed and these facilities modified to avoid impact on the high quality habitat areas (**Figure 6**). Impact on a small area (1.6ha) of medium quality habitat (of Habitat Area 4) could not be completely avoided due to the large areas required for these structures and objective to locate these away from remnant native vegetation wherever possible.

The processing plant and associated infrastructure are located adjacent to the Toongi-Dubbo Rail Line and village of Toongi on the western boundary of the

DZP Site. This location will not impact on any known Pink-tailed Worm-lizard habitat areas.

Roads between the open and processing plant could impact on Pink-tailed Worm-lizard habitat, however, this impact can minimised by avoiding Pink-tailed Worm-lizard habitat areas as much as possible and only crossing the habitat areas at sites where it will have least impact.

5.3 Conservation, Enhancement and Management of Known High-Quality Potential Habitat Areas

5.3.1 Creation and Enhancement of Habitat for the Pink-tailed Worm-lizard

A variety of measures will be implemented to create or enhance the habitat of the Pink-tailed Worm-lizard on the DZP Site. The attributes of habitat that are desired in created or enhanced areas are presented in Section 3.5. In general, the habitat areas to be created or enhanced will be on sites close to trachytes outcrops where the soils are derived from trachytes weathering and alluvial influx, where grass cover is extensive, where tree canopies are limited, where surface shelter rocks (or artificial shelter materials) are abundant, and where ant prey species are abundant.

5.3.2 Selection of Habitat Areas

With ideal habitat attributes pre-determined, the choice of sites for habitat creation and enhancement needs to be based on four further features:

1. proximity to known Pink-tailed Worm-lizard habitat,
2. utility in linking isolated Pink-tailed Worm-lizard habitat areas,
3. free of impacts associated with the establishment or operation of the mine, and
4. free of threatened plants or animals.

Using these criteria, the main focus for habitat creation and enhancement will take place in the area between Habitat Areas 1, 2 and 3 (**Figure 10**). This site was chosen as it has the right lithology, meets most of the ideal habitat components (except that it lacks surface shelter rocks) and links two apparently isolated groups of Pink-tailed Worm-lizards (on Habitat Area 1 and Habitat Area 3). Once established as linking habitat, it may serve as a corridor for any displaced Pink-tailed Worm-lizards seeking to move away from the open cut and Habitat Area 1 (whilst the western half of the open cut is developed) and investigate new habitat areas.

Other habitat areas may be developed later on. For example, the margins of Habitat Areas 5, 6 and 10 also appear suitable for habitat enhancement works, as do the lower slopes of Habitat Area 3. In the latter case, the habitat enhancement works may include thinning of the cypress-pine canopy, increased feral animal control and the re-establishment of native grasses.

Figure 10 Location of Habitat Enhancement Area

5.3.3 Land Surface Preparation

The new habitat area will be approximately 600 metres long and very between 100 and 150 metres wide (**Figure 10**). To prepare this area so that it retains a high grass cover, reduced tree cover and minimal shrub cover, the area will be slashed and then scarified. This will remove all of the shrub cover and sever small tree roots. By preparing the soil in this way, shrubs and small trees can be eliminated from the area and subsoil rocks may be exposed. Once the soil has been prepared, the area will need to be "seeded" with shallow surface rocks.

5.3.4 Collection and Re-use of Surface Rocks

To prepare the open cut for mining, the area will be stripped of vegetation with minor re-contouring of the hill to take place to accommodate the haul road, and utility easements. Prior to any earthwork in the open cut area, loose surface rocks will be manually collected and relocated to the habitat creation areas between Habitat Areas 1 and 3. The rocks will be spaced out between 1 and 4 metres apart across this area to create a corridor that is about 600 metres long and 100 metres wide. For such a large area, the surface rocks in the open cut area will not be sufficient and alternate surface cover materials will be used to complete the corridor (see Section 5.3.5).

5.3.5 Use of Artificial Shelter Materials

To supplement the natural surface rock placed out in the new habitat area, roofing tiles will be placed as either single tiles or groups of four overlapping tiles. Like the surface rocks, the tiles will be laid out at spacings of approximately 1 metre until the area is completely covered. Once the new habitat area has been seeded with surface rocks and tiles, the rocks and tiles will be numbered and their positions recorded on a central data base. The shelter sites will be numbered to facilitate subsequent monitoring of Pink-tailed Worm-lizards on the site.

Artificial shelter materials, such as tiles, have been used successfully in the ACT to provide habitat for Pink-tailed Worm-lizards (Osborne pers comm.). During these trials it was found that Pink-tailed Worm-lizards occupied the ant tunnels beneath the tiles within six months of the tiles being laid down. Clearly, the use of these tiles as habitat is dependent on the occupation of the soil beneath the tiles by prey ant species.

A trial is currently underway to test how quickly Pink-tailed Worm-lizards will colonise new sites where the only cover available are roof tiles. Tiles have been laid in as single tiles or as groups of four tiles (**Figure 11**). The number and type of animals sheltering under the tiles is recorded regularly, as are ground temperatures and soil moisture content. While this trial is still in its early stages, it is already evident that the presence of the tiles changes the soil temperature and humidity beneath them, and that a variety of small vertebrate and invertebrate animals utilise these sites when they are available (A. White, unpubl. data).

5.4 Passive Relocation of Pink-tailed Worm-lizards from the Eastern Half of the Open Cut

To enable the passive (unassisted) relocation of Pink-tailed Worm-lizards from the impact area to safe conservation areas, the open cut will be developed in two stages. The western half of the open cut will be excavated and developed first, allowing time for habitat corridors to become established leading from the eastern side of the open cut towards Dowd's Hill (Habitat Area 3). It is anticipated that work in the eastern side of the open cut will not start until 10 years after the commencement of excavation of the western side of the open cut. This should provide adequate time for any unassisted relocation to occur.

Passive relocations of this type have been used successfully in the ACT with Pink-tailed Worm-lizards occupying new habitat areas within 12 months of their creation (Osborne pers. comm.).

Figure 11 Roof tiles laid out as shelter habitat for the Pink-tailed Worm-lizard

5.5 Assisted Relocation of Pink-tailed Worm-lizards from the Western Half of the Open Cut

In the twelve month period leading up to the commencement of mining works in the western half of the open cut, repeated searches of the area to be disturbed will be carried out and any Pink-tailed Worm-lizards found will be collected, measured and relocated to the new habitat areas created nearby. When Pink-tailed Worm-lizards are found, the rock that they were found under will also be relocated to the new habitat area (to discourage other Pink-tailed Worm-lizards to recolonise this site within the open cut impact area). It is intended that this process will relocate many Pink-tailed Worm-lizards before this area is subject to major earthworks, however, it is acknowledged that it will not be possible to collect all Pink-tailed Worm-lizards from this area. Notwithstanding this fact, through the creation of the new habitat areas and through the passive and active relocation programs, a large proportion of the Pink-tailed Worm-lizards in the open cut area should be rescued.

The collection of Pink-tailed Worm-lizards is only likely to be successful at times when the lizards are close to surface (i.e. in Spring and autumn). Therefore, no collections of lizards will be attempted during summer or winter when the lizards are deeper underground and generally inaccessible.

5.6 Monitoring and Reporting

Progress reports will be prepared for AZL after each major survey and collection period (ie at the end of Spring and the end of Autumn). These reports will detail the areas surveyed, the animals collected and their relocation positions. It will also report on any modifications to the habitat areas that may be required.

An annual report will be prepared in June of each year to be submitted to both SEWPaC and OEH. This will contain the results of the two survey and collection periods for the year and recommend any changes to habitat modifications that may be required.

6.0 CONCLUSION

The establishment and operation of the open cut and associated waste management facilities associated with the Dubbo Zirconia Project will impact on some habitat areas occupied by the Pink-tailed Worm-lizard. A variety of measures will be adopted to ameliorate many of the impacts, but some habitat will still be lost as a result of the DZP. A large area of enhanced habitat will be created close by to known high quality habitat areas that are to be affected. Given the apparent success of similar habitat enhancement projects in the ACT, it is highly likely that the habitat enhancement works at Toongi will also result in the wider establishment of this species, and permit the connection of previously isolated populations.

7.0 BIBLIOGRAPHY

Barrer, P. 1992. A survey for *Aprasia parapulchella* along parts of the lower Molonglo River corridor. A report to the ACT Parks and Conservation Service. Page(s) 1-13.

Brown, G.W. 2009. Field surveys for the endangered Pink-tailed Worm Lizard *Aprasia parapulchella*, around Bendigo, north-western Victoria. A report to the Goulburn-Broken Catchment Management Authority. Victoria.

Cogger, H.G. (2000). *Reptiles and Amphibians of Australia - 6th edition*. Sydney, NSW: Reed New Holland.

Department of Environment and Climate Change 2007 Threatened Species Web site http://203.202.1.211/tsprofile/index.aspx

EcoBiological 2013. Habitat requirements of the Pink-tailed Worm Lizard: Ants and soil requirements. Prepared for OzArk Pty Ltd.

Goldney, D. 2001.

Jones, S.R. 1992. Habitat relationships, diet and abundance of the endangered pygopod *Aprasia parapulchella*. B. Appl. Sci. (Honours) thesis. University of Canberra.

Jones, S.R. 1999. *Conservation biology of the Pink-tailed Legless Lizard* Aprasia parapulchella. Page(s) 1-252. Ph.D. Thesis. University of Canberra. University of Canberra, Canberra.

Michael, D.R., and M.W. Herring. 2005. Habitat of the Pink-tailed Worm Lizard *Aprasia parapulchella* in Albury, NSW. Herpetofauna 35:103-111.

Osborne, W.S. & F.V.C. McKergow (1993). Distribution, population density and habitat of the Pink-tailed Legless Lizard *Aprasia parapulchella* in Canberra Nature Park, ACT. Page(s) 14-23. ACT Government, Canberra.

Osborne, W.S. & S.R. Jones (1995). Recovery plan for the Pink-tailed Worm Lizard *(Aprasia parapulchella). ACT Parks and Conservation Service Technical Report 10*. Department of Environment, Land and Planning, Tuggeranong.

Osborne. W. S., Lintermans, M and K.D. Williams. 1991. Distribution and conservation status of the endangered Pink-tailed Legless Lizard *Aprasia parapulchella* (Kulge). ACT Parks and Conservation Service Research Report 5.

Robertson, P. & G. Heard (2008). Report on field-surveys for the Pink-tailed Worm-lizard (*Aprasia parapulchella*) in the Bendigo region, central Victoria: Distribution, habitat associations and population attributes. Hurstbridge, Victoria: Wildlife Profiles Pty Ltd.

White, A.W. 2012. Surveys for the Pink-tailed Worm Lizard *Aprasia parapulchella* Dubbo Zirconia Project. Prepared for Alkane resources Pty Ltd.

White, A.W. 2013. Surveys for the Pink-tailed Worm Lizard *Aprasia parapulchella* Dubbo Zirconia Project. March 2013. Prepared for Alkane resources Pty Ltd.

Wilson, S., and G. Swan. 2008. *A Complete Guide to reptiles of Australia. 2nd edition.* New Holland Publishers. Sydney.

Wong, D.T.Y., S.R. Jones, W.S. Osborne, G.W. Brown, P. Robertson, D.R. Michael and G.M. Kay (2011). The life history and ecology of the Pink-tailed Worm-lizard *Aprasia parapulchella* Kluge - a review. *Australian Zoologist.* 35(4):927-940.

Appendix A

Habitat requirements of the Pink-tailed Worm-lizard: Ants and soil requirements.

EcoBiological

2013

This page has been intentionally left blank

WB13R_544-1254

Ant Population Monitoring and Soil Surveys within the Habitat of the Pink-tailed Worm Lizard

Dubbo Zirconia Project
Toongi, NSW

KLEINFELDER
Bright People. Right Solutions.

Prepared for:

ALKANE RESOURCES LTD
LEVEL 2, 21 CHURCH STREET
DUBBO NSW 2830

Ant Population Monitoring and Soil Surveys within the Habitat of the Pink-tailed Worm Lizard

Dubbo Zirconia Project
Toongi, NSW

Kleinfelder Report Number: WB13R_544-1254

Kleinfelder
64 Medcalf Street
Warners Bay, NSW 2282
Phone: 1300 881 869
Fax: 1300 881 035

ABN: 74 114 440 041

Document Control:

Version	Description	Date	Author	Technical Reviewer	Peer Reviewer
1.0	Draft for client review	2/05/2013	Dr. G Whyte	Aaron Mulcahy	Chelayne Evans

EXECUTIVE SUMMARY

The Pink-tailed Worm Lizard (Aprasia parapulchella) is listed as a vulnerable species under the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act) and the Threatened Species Conservation Act 1995 (TSC Act). Aprasia parapulchella has been identified within the locality of the proposed Dubbo Zirconia Project (DZP).

Aprasia parapulchella is a subterranean lizard species which feeds exclusively on ant broods. Ant assemblages and suitable soil characteristics have been identified as being important habitat characteristics of this species.

Kleinfelder was engaged by OzArk Environmental & Heritage Management to undertake ant population monitoring and soil surveys within the habitat of the Pink-tailed Worm Lizard (Aprasia parapulchella) within the DZP project area. Seven monitoring sites were established within the project area (two within the impact footprint and five within future offset areas).

Contents

Appendices

Tables

Figures

Plates

KLEINFELDER
Bright People. Right Solutions.

ABBREVIATIONS

AHD	Australian Height Datum
DP	Deposited Plan
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
DZP	Dubbo Zirconia Project
EEC	Endangered Ecological Community (category of Threatened Ecological Community)
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectares
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
MU	Map Unit

DEFINITIONS

Abundance – a relative measure of how common or rare a species (or attribute) is in a given location.

Brood – eggs, larvae and pupae within the care of an ant colony.

Conservation status – categories for describing the relative level of concern for a species, community or populations persistence in nature.

Direct impacts – impacts that directly affect habitat and individuals and include but are not limited to death through predation, trampling, poisoning of the organism itself, and the removal of suitable habitat.

Distribution – the overall area or geographical range in which a species is known to occur. Relative abundance will vary at different points within its geographical range.

Electrical Conductivity - The property of the conduction of electricity through water extract of soil. Used to determine the soluble salts in the extract, and hence soil stability.

Emmerson's Aggregate Test (EAT) - A classification of soil based on soil aggregate coherence when immersed in water. Classifies soils into eight classes and assists in identifying whether soils will slake, swell or disperse.

Habitat – an area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community and includes any biotic or abiotic component. The habitat of a species is usually far less extensive than distribution indicated on a map.

Home range – the area habitually traversed by an individual animal. It may be exclusive or overlap with the home ranges of other individuals of the same species.

Indirect impacts – occur when project-related activities affect resources in a manner other than a direct loss of the resource. A broad range of impacts need to be considered and include, but are not limited to, killing a species through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious changes in the water table, increased soil salinity, promotion of erosion, inhibition of nitrogen fixation, provision of a suitable seed bed for exotic weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas.

KLEINFELDER
Bright People. Right Solutions.

Life history – the stages of reproduction, growth, development, ageing and death of an organism.

Loam - A medium, textured soil of approximate composition 10 - 25% clay, 25 - 50% silt and <50% sand.

Local population – the population that occurs within the boundaries or vicinity of a study area.

Locality – means the area within a 10km radius of the study area.

Morpho-species – A recognisable taxonomic unit (RTU) distinguished by its morphology and presumed to be an individual species.

Mottling - The presence of more than one soil colour in the same soil horizon, not including different nodule or cutan colours.

Opportunistic – used, in reference to diet, to denote the eating of any of a wide variety of foods, depending upon their availability. In respect of reproduction, it refers to a pattern of breeding that is linked with irregular favourable conditions (particularly unpredictable rainfall in arid areas) rather than to season.

Order – a taxonomic unit below Class level often used to differentiate recognisable invertebrate groups such as beetles, moths and butterflies.

Particle Size Analysis (PSA) - the determination of the amount of the different size fractions in a soil sample such as clay, silt, fine sand, coarse sand and gravel.

Ped - An individual, natural soil aggregate.

Pedality - Refers to the relative proportion of peds in the soil (as strongly pedal, weakly pedal or non-pedal).

pH - A measure of the acidity or alkalinity of a soil.

Predator – a species which preys and thereby feeds on other animal species (invertebrate predators often prey on other invertebrates).

Range – this term has the same meaning as distribution, which is preferred.

Species Richness - the number of species within a defined area.

Study area – the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly.

Subject site – the area being investigated or assessed.

Subspecies – an interbreeding population within a species, differing measurably from one or more other populations and usually geographically separate from these.

Terrestrial – living on the ground.

Territory – an area occupied by one or more individuals and defended against other members of the species. A territory is usually centred on a more or less permanent nest, burrow, den or resting place.

Threatening process – a process that threatens, or has the potential to threaten, the survival or evolutionary development of species, populations or ecological communities. The definition is not limited to key threatening processes listed under the TSC Act.

Viable – a species, populations or ecological communities' capacity to successfully complete each stage of the life cycle under normal conditions.

KLEINFELDER
Bright People. Right Solutions.

1. INTRODUCTION

1.1 AIM

Kleinfelder was engaged by OzArk Environmental & Heritage Management to undertake an ecological assessment involving ant population monitoring and soil surveys within the habitat of the Pink-tailed Worm Lizard (*Aprasia parapulchella*) within the DZP project area.

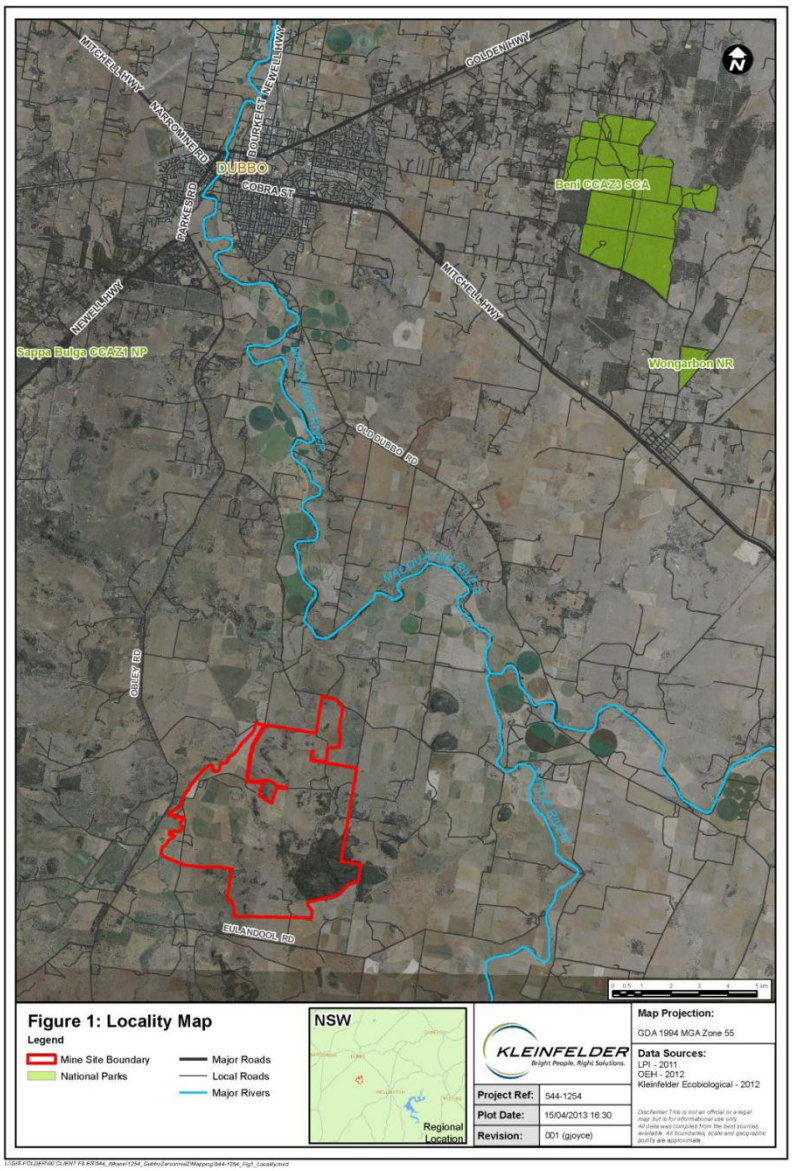
The ecological assessment aims to provide baseline information to elucidate the relationships between *A. parapulchella*, associated ant species and variations in soil type.

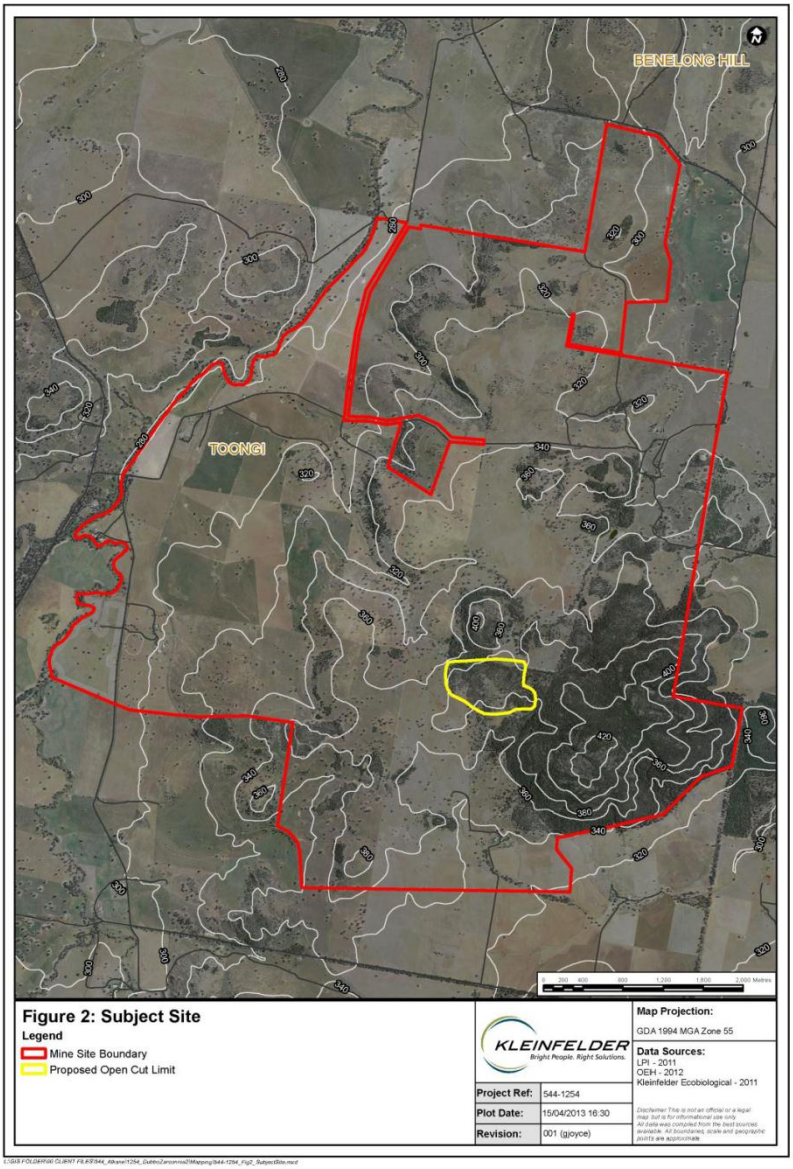
1.2 THE DUBBO ZIRCONIA PROJECT

The Dubbo Zirconia Project (DZP) is located near Toongi, which is approximately 30 kilometres south of the large regional centre of Dubbo and approximately 400km north-west of Sydney in the Central West Region of New South Wales (**Figure 1**). The Project is held by Australian Zirconia Ltd (AZL), a wholly owned subsidiary of Alkane Resources Ltd. The project area is centred on the Toongi trachyte intrusive, which contains highly elevated levels of zirconium, niobium, tantalum, yttrium and rare earth elements and constitutes a world class resource of these metals. A single open cut area is proposed to allow for extraction of the rare earth elements using mining techniques (**Figure 2**).

The DZP site has many infrastructure advantages with power and gas available from the state grids at Dubbo, and water accessible from the Macquarie River 10 kilometres to the north. Numerous local roads service the site from Dubbo and the nearby Newell and Mitchell Highways. The currently disused Dubbo to Molong railway passes immediately to the west and south of the site and could be reactivated to provide supply for process chemicals. The city of Dubbo with a population of 42,000 would be the main source for an anticipated basic start up operating workforce of about 200.

The commercial viability of the DZP (hereafter referred to as the project area) has been evaluated since the discovery of the ore body and is likely to become an important contributor to the zirconium, niobium, yttrium and rare earth industries.


MITCHELL HWY
NARROMINE RD
BOURKE ST
NEVERLL HWY
GOLDEN HWY
DUBBO
COBRA ST
PARKES RD
Beni CCAZ3 SCA
MITCHELL HWY
NEVERLL HWY
Sappa Bulga CCAZ1 NP
Wongarbon NR
OLD DUBBO RD
GILES RD
EULANDOOL RD
Figure 1: Locality Map
Legend
Mine Site Boundary
National Parks
Major Roads
Local Roads
Major Rivers
NSW
Regional Location
KLEINFELDER
Bright People. Right Solutions.
Project Ref: 544-1254
Plot Date: 15/04/2013 16:30
Revision: 001 (gjoyce)
Map Projection:
GDA 1994 MGA Zone 55
Data Sources:
LPI - 2011
OEH - 2012
Kleinfelder Ecobiological - 2012


BENELONG HILL
TOONGI
Figure 2: Subject Site
Legend
Mine Site Boundary
Proposed Open Cut Limit
KLEINFELDER
Bright People. Right Solutions.
Map Projection:
GDA 1994 MGA Zone 55
Data Sources:
LPI - 2011
OEH - 2012
Kleinfelder Ecobiological - 2011
Project Ref: 544-1254
Plot Date: 15/04/2013 16:30
Revision: 001 (gjoyce)

1.2.1 Objectives

Aprasia parapulchella is a subterranean lizard species which feeds exclusively on ant broods. Ant assemblages and soil characteristics have been identified as being important determinants of habitat suitability for this species.

The implementation of ant population monitoring and soil surveys within the habitat of *A. parapulchella* has the following objectives:

- To monitor changes in the composition of ant assemblages (diversity and abundance) within the impact footprint and potential offset areas; and
- To monitor changes in soil characteristics (textural and chemical) within the impact footprint and potential offset areas.

It is proposed that monitoring will eventually provide useful long-term data relevant to understanding the population dynamics of *A. parapulchella*. Monitoring will also examine the impacts of mine site disturbance and rehabilitation efforts such as habitat augmentation.

1.2.2 Scope

The scope of work for the current study includes the following:

- To develop a habitat assessment methodology in consideration of a range of habitat characteristics including the following:
  - Presence of *A. parapulchella* records;
  - Aspect;
  - Soil type;
  - Vegetation structure;
  - Surface rock abundance; and
  - Ant Abundance/ diversity.
- To conduct invertebrate sampling at seven (7) sites and examine the diversity and abundance of ant species; and

KLEINFELDER
Bright People. Right Solutions.

- To conduct soil sampling at seven (7) sites and examine the textural and chemical composition of soils.

KLEINFELDER
Bright People. Right Solutions.

2. LITERATURE REVIEW

2.1 THE PINK WORM-TAILED LIZARD

2.1.1 Habitat

The Pink-Tailed Worm Lizard (*Aprasia parapulchella*) is a cryptic species with specific habitat and dietary preferences. It has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011). Surface rocks are believed to be important for thermoregulation (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992).

Aprasia parapulchella prefers a grassy ground layer with little to no leaf litter and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008). A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991). Other associated grass species include Squirrel Tail Fescue (*Vulpia bromoides*), Wild Oats (*Avena fatua*), Red Grass (*Bothriochloa macra*) and Delicate Hairgrass (*Aira elegantissing*) (Jones 1999). Diverse grasslands may support more diverse invertebrate communities such as ants. This may also be a factor in terms of habitat suitability.

Aprasia parapulchella is often associated with the endangered White Box, Yellow Box, Blakely's Red Gum, Grassy Woodland and Derived Native Grassland community (EPBC Act 1999) (Wong 2011).

Areas with deeply imbedded stones/ rocks, exotic grasses (including modified pasture improved sites), weeds and/ or woody vegetation, are said to be unlikely to support *A. parapulchella* (Jones 1999; Osborne 1993; McKergow 1990).

In terms of soil associations, Osborne (1990 & 1993) reports that all records of *A. parapulchella* (ACT) were from areas underlain by mid to late Silurian acid to intermediate volcanics with soils consisting of friable sandy loams which are rocky (i.e. with some accumulation of organic matter on the surface).

The major threats to *A. parapulchella* include vegetation clearing, livestock grazing, exotic flora invasion and other disturbances such as the removal of bush rock or shale (Osborne et al 1991).

2.1.2 Lifecycle

Aprasia parapulchella has a late sexual maturation. Males are sexually mature at three years, while females are sexually mature at four years. This suggests that the species is relatively long lived (Jones 1999). Females lay two eggs inside the ant nest during summer and young appear in March (Jones 1999).

2.1.3 Behaviour

Aprasia parapulchella exhibits diurnal behaviour and is active throughout spring (August to mid-November), often becoming active shortly after rainfall (Osborne et al. 1991). Individuals have been found in autumn and winter; however detection at these times is unreliable (Osborne et al. 1991). The species is rarely active when temperatures exceed 25°C or in dry summer weather. Hence it has been suggested that temperature and moisture may influence species activity (Jones 1999).

Although largely subterranean, it is believed that *A. parapulchella* can move around on the surface to some extent. This is supported by evidence such as the occurrence of individuals 30m meters from their habitat after bushfire (Wong & Osborne Unpublished data cited in Wong 2011). Moreover, the diversity of ant species within the lizard's diet suggests that it may also forage beyond its immediate environment.

2.1.4 Associations with Ants

The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011). Ant surface activity is strongly seasonal and cohabitation appears to occur mainly in March, September and October (Jones 1999).

Aprasia parapulchella has been recorded to feed on approximately fifteen species of ants (4-5 subfamilies) and one termite species. Analysis by Jones (1999) found that approximately half (53%) of *A. parapulchella* records co-occurred with Tyrant Ant (*Iridomyrmex rufoniger*) and that the lizard preferred sites occupied by this species. In addition, *A. parapulchella* appears to prefer sites occupied by species from the Dolichoderinae subfamily (Wong 2011).

Other ant species within the lizard's diet include *Pheidole* spp., *Paratrechina* spp. and *Rhytidoponera metallica* (Jones 1999).

The ability of *A. parapulchella* to avoid attack by aggressive ant species is largely unknown; however, chemical signals have been suggested as a possible mechanism (Jones 1999).

KLEINFELDER
Bright People. Right Solutions.

3. MATERIALS AND METHODS

3.1 SITE SELECTION

Seven (7) monitoring sites were selected within the subject site (**Figure 3**). Two (2) sites were selected within the impact footprint and five (5) sites were selected in potential offset areas.

All sites occurred in areas where *A. parapulchella* individuals have been previously recorded. The habitat suitability of the sites was variable.

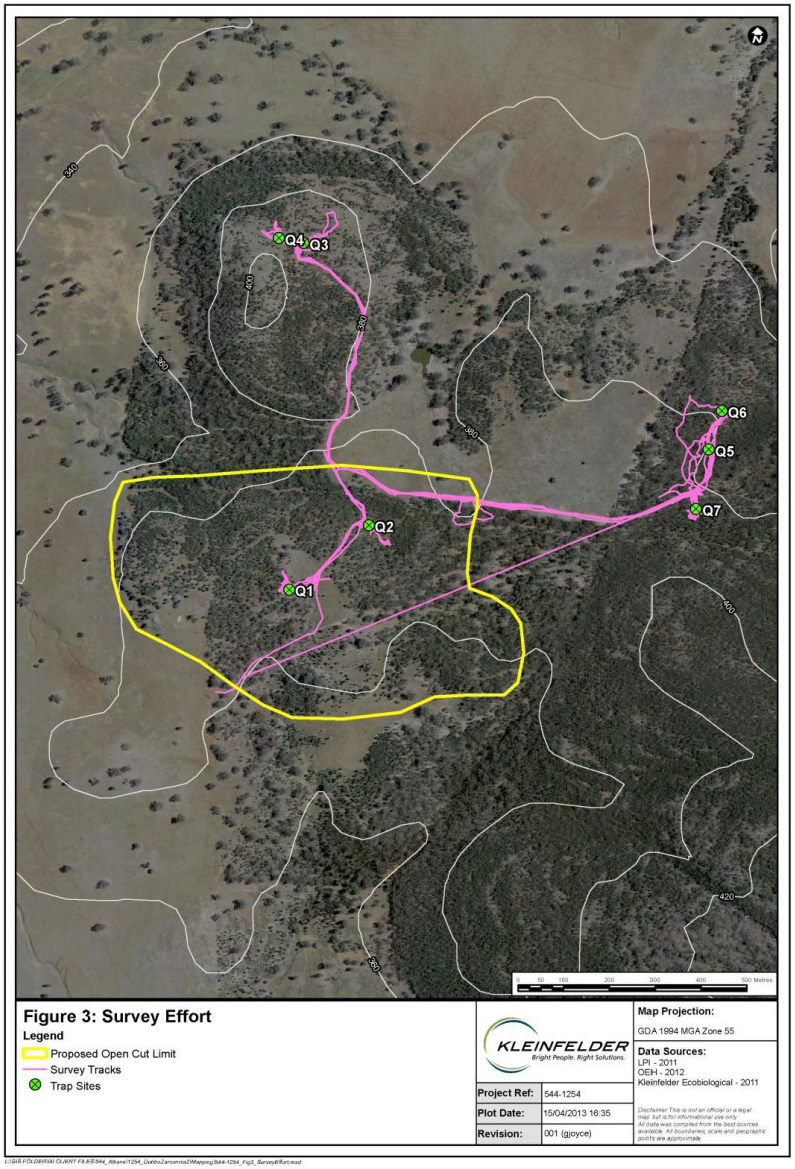
3.1.1 Weather Conditions

The assessment was conducted from 09 to 10 April 2013. Weather conditions during this period were suitably warm for ant activity (**Table 1**).

Table 1: Weather conditions during the survey period.

Date	Day	Daily Max Temp	Rain
		°C	mm
09/04/2013	Tuesday	26.6	0
10/04/2013	Wednesday	26.7	0

Source: Bureau of Meteorology 2013.


Q1
Q2
Q3
Q4
Q5
Q6
Q7
380
400
420
Figure 3: Survey Effort
Legend
Proposed Open Cut Limit
Survey Tracks
Trap Sites
KLEINFELDER
Bright People. Right Solutions.
Project Ref: 544-1254
Plot Date: 15/04/2013 16:35
Revision: 001 (gjoyce)
Map Projection:
GDA 1994 MGA Zone 55
Data Sources:
LPI - 2011
OEH - 2012
Kleinfelder Ecobiological - 2011

KLEINFELDER
Bright People. Right Solutions.

3.2 SITE ATTRIBUTES

3.2.1 Landscape Characteristics

Observations relevant to soil, geology and topography were made within each site to identify individual landscape characteristics. The definitions for landform and landscape elements are as per the Australian Soil and Land Survey Handbook (Third Edition).

The coverage of surface rock was estimated at each site as a percentage. Disturbance events such as weeds, fire, clearing, logging and grazing were also recorded at each site to give an indication of overall site condition.

3.2.2 Floristics

Floristic structure was examined within each site during a 30min random meander. The projective foliage coverage (PFC) was estimated for canopy, shrub and ground layers.

Plant specimens were collected for the dominant plant species and floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (http://plantnet.rbgsyd.nsw.gov.au).

3.3 INVERTEBRATE SURVEY

3.3.1 Invertebrate Collection

Pitfall traps were used to target ant species within each survey site. Five (5) plastic ice-cream containers measuring 220 x 145 x 70 mm were placing within the ground at each site. The containers were positioned with the rims level to the soil surface to capture ground dwelling invertebrates such as foraging ants (Dahms 1997; Oliver et al. 1999). Each container was positioned approximately 5-10m from the next in a range of habitats such as open sun, alongside logs, in dense grass and within the shade of dense shrubs (**Plate 1**).

The containers were filled with approximately 1L of water/detergent solution. These were left in place for a 24 hour period after which their content was emptied. The liquid from each trap was filtered through a fine sieve (<1 mm) to remove invertebrates which were then placed in labelled sampling jars containing 70% ethyl alcohol. Squirt bottles containing ethyl alcohol

were used to remove entangled invertebrates. All traps and sieves were inspected and washed thoroughly to ensure that all invertebrates were collected.

Plate 1: Pitfall Trap for sampling ant species

3.3.2 Invertebrate Identification

Invertebrates were sorted and identified using an Olympus SZ61 Zoom stereomicroscope (6.7 x 45 magnifications). All ant specimens were identified to genus level using the CSIRO online key (http://anic.ento.csiro.au/ants/) and then to morpho-species or Recognisable Taxonomic Units (RTUs). This is a recognised methodology used to sort and identify invertebrates for biological surveys and is a time and cost efficient technique (Beattie & Oliver 1994). Ants were identified to species level by Dr. Steve Shattuck (CSIRO).

All ant specimens were stored in 70% ethyl alcohol. A voucher collection for the study area will be maintained within Kleinfelder's invertebrate collection.

KLEINFELDER
Bright People. Right Solutions.

3.4 SOIL SURVEY

3.4.1 Sampling

One soil sample (1kg) was taken from each survey site for soil analysis. Only the upper 30cm of soil was sampled using a hand trowel. Soil sampling involved collecting and combining ten 100g subsamples from the soil surface within a 20m² area of each survey site. The subsamples were combined in sealed ziplock plastic bags. These were stored below 5ºC until they could be further analysed.

3.4.2 Field Analysis

A shallow soil test pit (30cm) was excavated within each site to examine the soil profile in accordance with the soil classification procedures in the Australian Soil and Land Survey Field Handbook (McDonald et al 1990).

Soil layers at each profile site were assessed according to a procedure devised by Elliot and Veness (1981). This procedure assesses soils based on grading, texture, structure, consistency, mottling and root presence. Soil colours were assessed according to the Munsell Soil Colour Charts (Macbeth 1994).

3.4.3 Laboratory Analysis

Soil samples were analysed to further establish their geochemical characteristics. The samples were analysed for the following parameters:

- Electrical Conductivity (Ds/m): Salinity;
- pH;
- pH (Cacl2);
- Emerson Aggregate Test; and
- Texture (Particle size analysis).

Definitions and methodologies used to measure each of these parameters are presented in **Appendix 2**.

4. RESULTS

4.1 HABITAT ASSESSMENT

A habitat assessment methodology has been developed specifically for *A. parapulchella*. A range of habitat characteristics were examined and scored at each survey location. Each habitat character is weighted depending on its assumed importance (**Table 2**). The maximum habitat score is twenty five (25) which indicates optimum quality habitat.

Table 2: Habitat assessment methodology

Habitat Character	Score Criteria	Total
Record of Presence Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting (/10).	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect *A. parapulchella* has strong associations with sloping, open landscapes (Wong 2011).	Absent = 0	1
	Present = 1	
Well-Draining Soil *A. parapulchella* has strong associations with well drained soils (Wong 2011).	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage *A. parapulchella* prefers relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	≥60% Canopy Coverage = 0	3
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover *A. parapulchella* prefers a grassy ground layer with little to no leaf litter (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008). A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991.	≤25% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	3
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	≤25% Rock Coverage = 0	3

Habitat Character	Score Criteria	Total
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992).	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
	Score Criteria	
	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	
	≥ 3 Ant species (5 pitfall	
	traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Ant Abundance The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall	
	traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		**25**

KLEINFELDER
Bright People. Right Solutions.

4.1.1 Site 1 Characteristics

Plate 2: **Monitoring Plot 1**

***A. parapulchella* Recorded:** Yes (2011 & 2012)

Topography: Crest of gradual slope

Soil Type: Fine Sandy Loam

Surface Rock Abundance: 50% Coverage

Vegetation Structure: 30-40% Canopy Coverage, 1-5% Shrub Coverage, 40-50% Ground Coverage

KLEINFELDER
Bright People. Right Solutions.

Floristic Diversity: Moderate - High

The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum) and *Callitris glaucophylla* (White Cypress Pine).

Shrub species include *Acacia uncinata* (Round Leaved Wattle) and *Hibbertia obtusifolia* (Hoary Guinea Flower).

The groundcover contains a moderately diverse assemblage of grasses including *Aristida jerichoensis* var *subspinulifera* (Jerico Wiregrass), *Aristida ramose* (Purple Wiregrass), *Austrostipa scabra* subsp *scabra* (Speargrass), *Bothriochloa macra* (Red-leg Grass), *Digitaria ammophila* (Silky Umbrella Grass), *Digitaria diffusa* (Open Summer Grass) and *Enneapogon nigricans* (Nigger Heads).

Site 1 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	≥60% Canopy Coverage = 0	2
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	≤25% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	2
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	≤25% Rock Coverage = 0	2
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		22

KLEINFELDER
Bright People. Right Solutions.

4.1.2 Site 2 Characteristics

Plate 3: **Monitoring Plot 2**

***A. parapulchella* Recorded:** Yes (2011 & 2012)

Topography: Crest of gradual slope

Soil Type: Sandy Loam

Surface Rock Abundance: 50% Coverage

Vegetation Structure: 40-50% Canopy Coverage, 30-40% Shrub Coverage, 50-60% Ground Coverage

Floristic Diversity: Moderate

The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum), *Callitris glaucophylla* (White Cypress Pine) and *Allocasuarina verticillata* (Drooping Sheoak).

Shrub species include *Acacia doratoxylon* (spearwood) and *Mirbelia pungens* (Prickly Mirbelia).

The groundcover is dominated by grasses including *Aristida jerichoensis* var *subspinulifera* (Jerico Wiregrass), *Aristida ramosa* (Purple Wiregrass) and *Enneapogon nigricans* (Nigger Heads).

3 May 2013 Page 30 Ref: WB13R_544-1254

Site 2 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	≥60% Canopy Coverage = 0	2
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	≤25% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	2
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	≤25% Rock Coverage = 0	2
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		22

KLEINFELDER
Bright People. Right Solutions.

4.1.3 Site 3 Characteristics

Plate 4:	**Monitoring Plot 3**
***A. parapulchella* Recorded:** Yes (2011 & 2012)	
Topography: Gradual slope	
Soil Type: Fine Sandy Loam	
Surface Rock Abundance: 30% Coverage	
Vegetation Structure: 20-30% Canopy Coverage, 5-10% Shrub Coverage, 70-80% Ground Coverage	
Floristic Diversity: Moderate The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum) and *Callitris glaucophylla* (White Cypress Pine). Shrub species include *Mirbelia pungens* (Prickly Mirbelia). The groundcover is dominated by grasses including *Bothriochloa macra* (Red-leg Grass), *Digitaria ammophila* (Silky Umbrella Grass), *Digitaria diffusa* (Open Summer Grass) and *Enneapogon nigricans* (Nigger Heads).	

3 May 2013 Page 32 Ref: WB13R_544-1254

Site 3 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	≥60% Canopy Coverage = 0	2
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	≤25% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	3
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	≤25% Rock Coverage = 0	1
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	1
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		20

KLEINFELDER
Bright People. Right Solutions.

4.1.4 Site 4 Characteristics

Plate 5:	**Monitoring Plot 4**
***A. parapulchella* Recorded:** Yes (2011 & 2012)	
Topography: Gradual slope	
Soil Type: Fine Sandy Loam	
Surface Rock Abundance: 30% Coverage	
Vegetation Structure: 20-30% Canopy Coverage, 5-10% Shrub Coverage, 70-80% Ground Coverage	
Floristic Diversity: Moderate The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum) and *Callitris glaucophylla* (White Cypress Pine). Shrub species include *Mirbelia pungens* (Prickly Mirbelia). The groundcover is dominated by grasses including *Bothriochloa macra* (Red-leg Grass), *Digitaria ammophila* (Silky Umbrella Grass), *Digitaria diffusa* (Open Summer Grass) and *Enneapogon nigricans* (Nigger Heads).	

3 May 2013 Page 34 Ref: WB13R_544-1254

Site 4 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	≥60% Canopy Coverage = 0	2
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	≤25% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	3
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	≤25% Rock Coverage = 0	1
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		22

KLEINFELDER
Bright People. Right Solutions.

4.1.5 Site 5 Characteristics

Plate 6:	Monitoring Plot 5
***A. parapulchella* Recorded:** Yes (2011 & 2012)	
Topography: Gradual slope	
Soil Type: Loamy Sand	
Surface Rock Abundance: 20% Coverage	
Vegetation Structure: 50-60% Canopy Coverage, 5-15% Shrub Coverage, 30-40% Ground Coverage	

Floristic Diversity: Moderate

The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum), *Eucalyptus albens* (White Box), *Eucalyptus microcarpa* (Grey Box) and *Callitris glaucophylla* (White Cypress Pine).

Shrub species include *Acacia doratoxylon* (spearwood) and *Eremophila longifolia* (Emu Bush).

The groundcover contains a moderately diverse assemblage of species including grasses such as *Aristida jerichoensis* var *subspinulifera* (Jerico Wiregrass) and *Rytidosperma fulvum* (Wallaby Grass). Other Groundcover species include *Cheilanthes sieberi* subsp *sieberi* (Poison Rock Fern), *Gonocarpus elatus* (Raspwort), *Fimbristylis dichotoma* (Common Fringe-sedge) and *Calotis cuneifolia* (Purple Burr-daisy).

KLEINFELDER
Bright People. Right Solutions.

Site 5 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	>59% Canopy Coverage = 0	0
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	<24% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	1
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	<24% Rock Coverage = 0	0
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	2
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		16

KLEINFELDER
Bright People. Right Solutions.

4.1.6 Site 6 Characteristics

Plate 7:	**Monitoring Plot 6**
***A. parapulchella* Recorded:** Yes (2011 & 2012)	
Topography: Gradual slope	
Soil Type: Sandy Loam	
Surface Rock Abundance: 20% Coverage	
Vegetation Structure: 50-60% Canopy Coverage, 5-15% Shrub Coverage, 20-30% Ground Coverage	

Ref: WB13R_544-1254 Page 39 3 May 2013

KLEINFELDER
Bright People. Right Solutions.

Floristic Diversity: Moderate

The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum), *Eucalyptus albens* (White Box), *Eucalyptus microcarpa* (Grey Box) and *Callitris glaucophylla* (White Cypress Pine).

Shrub species include *Acacia doratoxylon* (spearwood) and *Eremophila longifolia* (Emu Bush).

The groundcover contains a moderately diverse assemblage of species including grasses such as *Aristida jerichoensis* var *subspinulifera* (Jerico Wiregrass) and *Rytidosperma fulvum* (Wallaby Grass). Other Groundcover species include *Cheilanthes sieberi* subsp *sieberi* (Poison Rock Fern), *Gonocarpus elatus* (Raspwort), *Fimbristylis dichotoma* (Common Fringe-sedge) and *Calotis cuneifolia* (Purple Burr-daisy).

Site 6 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	>59% Canopy Coverage = 0	0
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	<24% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	1
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	<24% Rock Coverage = 0	0
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		17

KLEINFELDER
Bright People. Right Solutions.

4.1.7 Site 7 Characteristics

Plate 8:	Monitoring Plot 7
***A. parapulchella* Recorded:** Yes (2011 & 2012)	
Topography: Gradual slope	
Soil Type: Loamy Sand	
Surface Rock Abundance: 10% Coverage	
Vegetation Structure: 50-60% Canopy Coverage, 5-15% Shrub Coverage, 50-60% Ground Coverage	

Floristic Diversity: Moderate

The dominant canopy species are *Eucalyptus dealbata* (Tumbledown Redgum), *Eucalyptus albens* (White Box), *Eucalyptus microcarpa* (Grey Box) and *Callitris glaucophylla* (White Cypress Pine).

Shrub species include *Acacia doratoxylon* (spearwood) and *Eremophila longifolia* (Emu Bush).

The groundcover contains a moderately diverse assemblage of species including grasses such as *Aristida jerichoensis* var *subspinulifera* (Jerico Wiregrass) and *Rytidosperma fulvum* (Wallaby Grass). Other Groundcover species include *Cheilanthes sieberi* subsp *sieberi* (Poison Rock Fern), *Gonocarpus elatus* (Raspwort), *Fimbristylis dichotoma* (Common Fringe-sedge) and *Calotis cuneifolia* (Purple Burr-daisy).

KLEINFELDER
Bright People. Right Solutions.

Site 7 Habitat Assessment:

Habitat Characteristics		Score/25
Record of Presence	No Record = 0	10
	≤50 years = 2	
	≤20 years = 4	
	≤10 years = 6	
	≤5 years = 8	
	≤2 years = 10	
Sloping Aspect	Absent = 0	1
	Present = 1	
Well-Draining Soil	Clay = 0	2
	Sandy Clay Loam = 1	
	Sandy Loam = 2	
Absence of Dense Canopy Coverage	>59% Canopy Coverage = 0	0
	≤60% Canopy Coverage = 1	
	≤40% Canopy Coverage = 2	
	≤20% Canopy Coverage = 3	
Diverse Grassy Groundcover	<24% Coverage or ≤ 3 grass species (20 x 20 Area) = 0	2
	≥25% Coverage or ≥ 3 grass species (20 x 20 Area) = 1	
	≥50% Coverage or ≥ 6 grass species (20 x 20 Area) = 2	
	≥75% Coverage or ≥ 10 grass species (20 x 20 Area) = 3	
Surface Rock	<24% Rock Coverage = 0	0
	≥25% Rock Coverage = 1	
	≥50% Rock Coverage = 2	
	≥75% Rock Coverage = 3	
Ant Abundance	≤ 3 Ant species (5 pitfall traps 20 x 20 Area) = 0	3
	≥ 3 Ant species (5 pitfall traps 20 x 20 Area) = 1	
	≥ 6 Ant species (5 pitfall traps 20 x 20 Area) = 2	
	≥ 9 Ant species (5 pitfall traps 20 x 20 Area) = 3	
Total		18

4.1.8 Habitat Assessment Summary

All survey sites contained habitat considered suitable for *A. parapulchella* (**Table 3**). The habitat assessment revealed that sites 1, 2 and 4 had the highest habitat values. Sites 5 and 6 have the lowest habitat value. These differences were mainly attributed to differences in canopy coverage and ant abundance.

Table 3: Habitat assessment summary for survey sites 1-7

Habitat Characteristics	Survey Sites						
	1	2	3	4	5	6	7
Record of Presence	10	10	10	10	10	10	10
Sloping Aspect	1	1	1	1	1	1	1
Well-Draining Soil	2	2	2	2	2	2	2
Absence of Dense Canopy Coverage	2	2	2	2	0	0	0
Diverse Grassy Groundcover	2	2	3	3	1	1	2
Surface Rock	2	2	1	1	0	0	0
Ant Abundance	3	3	1	3	2	3	3
Total Habitat Score / 25	**22**	**22**	**20**	**22**	**16**	**17**	**18**
Total Habitat Score (%)	**88**	**88**	**80**	**88**	**64**	**68**	**72**

4.2 ANT SURVEY

A total of 4304 ant specimens were collected during the survey. The number of ant specimens collected from each survey site is presented (**Table 4**).

Table 4: Abundance of ant specimens collected at survey sites 1-7

Subfamiy	Species	Survey Sites						
		1	2	3	4	5	6	7
Dolichoderinae	*Iridomyrmex brunneus*	500	500	800	200	300	200	600
Dolichoderinae	*Iridomyrmex purpueus*							
Ectatomminae	*Rhytidoponera (sp.3)*		10					
Ectatomminae	*Rhytidoponera (sp.4)*		12					
Ectatomminae	*Rhytidoponera metallica*	200	60	100	60	20	20	200
Ectatomminae	*Rhytidoponera punctiventris*	8	11	20		15	6	30
Formicinae	*Camponyrma (sp.1)*							
Formicinae	*Camponyrma (sp.2)*							
Formicinae	*Camponotus (undescribed sp. 8)*				2			
Formicinae	*Camponotus aenopilosis*	20	10			15		10
Formicinae	*Camponotus capito*	12					10	

Subfamiy	Species	Survey Sites						
		1	2	3	4	5	6	7
Formicinae	*Camponotus claripes*	15	20					10
Formicinae	*Camponotus lownei*	4					15	
Formicinae	*Camponotus nigriceps*		10			5		
Formicinae	*Camponotus rubiginosus*	12	10		1	10	25	5
Formicinae	*Melophorus sp.*						4	
Formicinae	*Notoncus capitatus*				10			
Formicinae	*Notoncus ectatomnoides*	5	12		20		25	
Formicinae	*Opisthopsis rufithorax*							60
Formicinae	*Polyrhachis semiaurata*							
Myrmicinae	*Calomyrmex (sp.1)*				5			
Myrmicinae	*Crematogaster (sp.1)*	10			2			
Myrmicinae	*Meranoplus (sp.1)*					2	1	6
Myrmicinae	*Peronomyrmex (sp.1)*					2		
Myrmicinae	*Phediole (sp.1)*			5				2
Myrmicinae	*Phediole (sp.2)*			2				
Myrmeciinae	*Myrmercia tepperi*	20	18					
	Total Number of specimens	**806**	**673**	**927**	**300**	**369**	**306**	**923**
	Total Number of Species	**11**	**11**	**5**	**9**	**8**	**9**	**9**

4.2.1 Ant Abundance

Ants are often identified as being important for ecosystem functionality due to the variety of roles they play (i.e. agents of seed dispersal, pollination, herbivory and nutrient cycling). Ants can therefore be used as bio-indicators of ecosystem health (McGeogch 1998; Majer et al. 2007).

The abundance of ants collected at each of the survey sites was variable between survey sites (**Figure 4**). The greatest abundances were collected from sites 3 and 7. The lowest abundances were collected from sites 4 and 6.

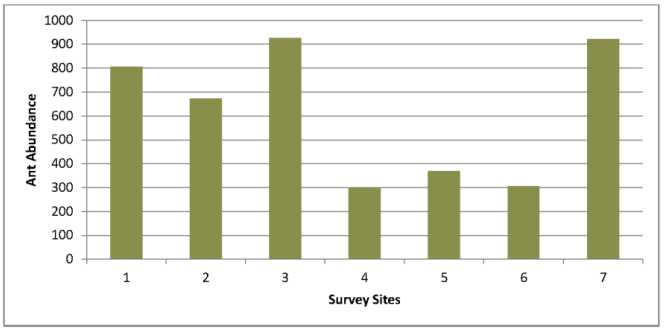


Figure 4: **The abundance of ants within each survey site.**

4.2.2 Ant Species

Twenty three (23) ant species were identified during the survey. These species belonged to fourteen genera within 5 subfamilies (**Table 4**). The most abundant species was *Iridomyrmex brunnea*, which accounted for 72% of all specimens collected. The second most abundant species was *Rhytidoponera metallica* which accounted for 15.3% of all specimens collected. The most diverse genus was *Camponotus*, which was represented by eight species. Rarer ant species included most of the genera within the Mirmicinae subfamily (*Calomyrmex*, *Crematogaster*, *Meranoplus*, *Peronomyrmex* and *Pheidole*).

Baseline ant surveys conducted in December 2012 resulted in the identification of nineteen (19) ant species. Thirteen (13) of these species were re-collected during the current survey. Ten (10) ant species were collected for the first time. A total of twenty seven (27) ant species have now been identified from the project area.

Sites 1 and 2 contained the greatest diversity of ant species. Sites 3 and 5 had the lowest diversity of ant species. It appears that all sites contain sufficiently diverse ant assemblages which could potentially provide a food resource for *A. parapulchella* (**Figure 5**).

KLEINFELDER
Bright People. Right Solutions.

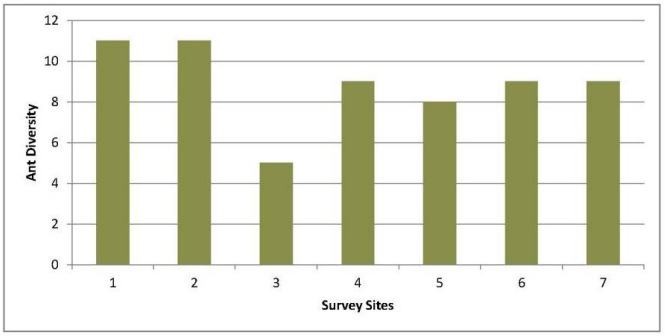


Figure 5: **The diversity of ants within each survey site.**

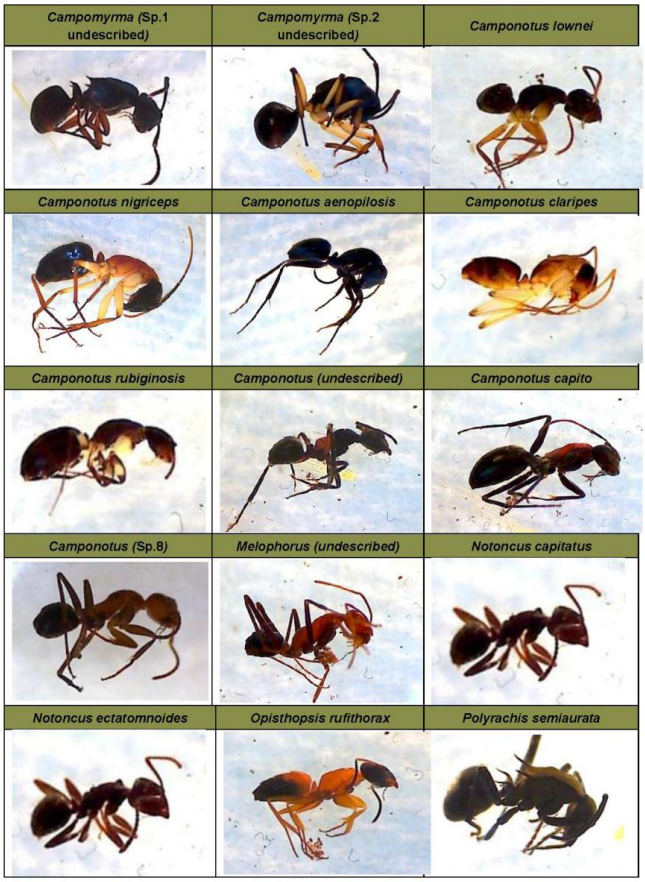
Given that ten (10) ant species were collected for the first time, is likely that the samples represent a smaller fraction of the actual assemblage of species occurring within the project area. It is estimated that the project area may contain as many as sixty (60) ant species in a variety of habitats. A photographic record of all ant species collected from the past two surveys is presented (**Table 5**).

Table 5: **Photographic record of all ant species**

Iridomyrmex brunneus	*Iridomyrmex purpureus*	*Rhytidoponera metallica*
		
Rytidoponera punctiventris	*Rhytidoponera* (Sp.3)	*Rhytidoponera* (Sp.4)
		

3 May 2013 Page 48 Ref: WB13R_544-1254

KLEINFELDER
Bright People. Right Solutions.



Ref: WB13R_544-1254 Page 49 3 May 2013

KLEINFELDER
Bright People. Right Solutions.

Myrmecia tepperi	*Crematogaster* (Sp.1)	*Meranoplus* (Sp.1)
		
Paratechina (Sp.1)	*Peronomyrmex* (Sp.1)	*Pheidole* (Sp.1)
		

4.2.3 Ants and *A. parapulchella*

In terms of ecology, the majority of the ant species collected are ground dwelling foragers which have an omnivorous diet including seeds, nectar, pollen, smaller insects and various forms of detritus such as animal carrion. Given that all of the species are colony forming and as such produce aggregations of eggs and larvae, each species is considered to be a potential food resource for *A. parapulchella*.

Ant species identified within the project area which are previously known to be food species of *A. parapulchella* include *Pheidole* spp., *Paratrechina* spp. and *Rhytidoponera metallica* (Jones 1999).

4.2.4 Ecology of Ant Genera

Information relevant to the ecology of ant genera identified within the project area is presented in **Appendix 1**.

4.3 SOIL ANALYSIS

4.3.1 Field Analysis

An examination of the soil samples revealed that the survey sites had similar characteristics in terms of soil structure and texture (**Table 6**). All sites had similarly shallow soils (25-35cm) above extensive sheets of underlying parent Silurian rock. All soils had a similar red/brown colour, sandy texture and loose consistency.

Table 6: Textural characteristics of each of the soil samples (survey sites 1-7)

Survey Site	Layer	Depth	Moisture	Colour	Mottles	Structure	Ped Size	Consistency
1	1	25cm	Low	5YR 5/6	No	Angular/ blocky	2-7mm	Loose
2	1	25cm	Low	5YR 6/4	No	Angular/ blocky	2-4mm	Loose
3	1	25cm	Low	5YR 5/6	No	Angular/ blocky	1-5mm	Loose
4	1	25cm	Low	5YR 6/4	No	Angular/ blocky	1-6mm	Loose
5	1	25cm	Low	5YR 5/6	No	Angular/ blocky	1-6mm	Loose
6	1	25cm	Low	5YR 6/4	No	Angular/ blocky	1-6mm	Loose
7	1	25cm	Low	5YR 6/4	No	Angular/ blocky	1-6mm	Loose

4.3.2 Soil Profiles

An examination of the soil profiles indicated that each of the sites contained similarly sandy soils which were rich in fragments of rocky material (**Plate 8**). This is consistent with the habitat requirements of *A. parapulchella* as described in the literature.

Plate 9: **Typical soil profile within survey sites of the project area**

4.3.3 Laboratory Analysis

The laboratory analysis revealed that all soil samples had similar characteristics in terms of their geochemical properties (**Table 7**). All soils may be described as non-saline and slightly acidic. The EAT indicates that al samples consist of highly aggregated materials exhibiting low dispersion characteristics. Although greater quantities of clay were identified at some sites, all sites contained sufficient quantities of sand which is likely to create the loose consistency required for *A. parapulchella*.

Table 7: Laboratory analysis of each of the soil samples (survey sites 1-7)

			C1A/5	C2A/4	C2B/4	P7B/2 Particle Size Analysis (%)					P9B/2	
Survey Site	Layer	Depth	EC (ds/m)	pH	pH (CaCl2)	Clay	Silt	F Sand	C Sand	Gravel	EAT	Texture
1	1	25cm	<0.01	6.1	4.8	14	18	37	27	4	8	Fine Sandy Loam
2	1	25cm	0.06	5.3	4.3	9	19	41	23	8	8	Sandy Loam
3	1	25cm	<0.01	6.0	4.7	11	13	57	10	9	8	Fine Sandy Loam
4	1	25cm	0.01	5.9	4.8	12	15	55	11	7	8	Fine Sandy Loam
5	1	25cm	<0.01	6.2	4.9	10	14	38	28	10	8	Loamy Sand
6	1	25cm	<0.01	5.2	4.1	11	13	42	25	9	8	Sandy Loam
7	1	25cm	0.01	5.1	4.0	5	4	51	27	13	8	Loamy Sand

5. DISCUSSION

5.1 HABITAT QUALITY

The findings of the survey are positive in terms of the availability of habitat for *A. parapulchella* within the subject site. Although the survey sites showed variations in terms of habitat quality, it appears that *A. parapulchella* habitat is extensive within the proposed offset areas.

The main limitation in terms of habitat is the excessively dense canopy coverage in some area, the availability of shallow imbedded surface rock and the abundance of native grasses.

5.1.1 Recommendation

It is recommended that areas previously identified as high quality or marginal habitat for *A. parapulchella* (A. White Mapping) are validated using the habitat scoring methodology.

5.2 FOOD AVAILABILITY

Twenty three (23) ant species were identified during the survey and it is likely that more species are yet to be detected within the subject site. *A. parapulchella* has been shown to feed on the broods of a range of ant species.

At this stage, it appears likely that ant abundance is not a limiting factor in terms of availability of habitat for *A. parapulchella*. *A. parapulchella* is likely to feed on several of the species identified within the subject site.

5.3 HABITAT AUGMENTATION

Given that the habitat of *A. parapulchella* appears to be easily defined, areas identified as being low quality habitat may be augmented and therefore improved. This may encourage the colonisation of *A. parapulchella*. In most cases, this may involve simple land management techniques discussed further below.

5.3.1 Recommendations

The following recommendations have the potential to increase the availability of *A. parapulchella* by augmenting the habitat within the subject site:

- A controlled burn should be implemented to encourage species such as native grasses and discourage the encroachment of exotic species such as pasture weeds;
- Areas containing dense thickets of *Callitris glaucophylla* (White Pine) should be either thinned or burned to reduce the coverage and encourage the proliferation of grasses and other groundcover species;
- Rocky material should be brought onto the site to increase the availability of shallow imbedded rocks in certain areas;
- Surface rock should also be salvaged from the open cut before mining operations commence; and
- Artificial substrates such as roof tiles should be trialled as potential supplementary habitat for *A. parapulchella*.

5.4 ARTIFICIAL HABITAT

Methods to create artificial habitat for A. parapulchella are currently being developed (P. Cameron pers. comm). Roof tiles are currently being trailed as a substitute for surface rock (**Plate 10**).

KLEINFELDER
Bright People. Right Solutions.

Plate 10: **Roof tiles used as artificial habitat for *A. parapulchella***

5.4.1 Recommendations

The following recommendations relate to creating artificial habitat for A. parapulchella.

- A range of material should be trialled as substitutes for surface rock. These may include tiles of different size and thickness. Flat pieces of quarried rock may also be a suitable substitute (irregular in shape);
- The depth of soil within which the tiles are embedded should also be experimented with; and
- Site selection for the placement of artificial habitat should be variable (i.e. different aspects, shaded versus open areas).

5.5 MONITORING

The implementation of a monitoring program would allow an examination of the effectiveness of all habitat augmentation efforts. This would involve collecting baseline data before habitat augmentation occurs and then periodically after to identify potential trends.

5.5.1 Recommendations

Monitoring should be collected annually from each monitoring station. The following parameters should be assessed:

- Seasonal climate: using data from the nearest weather station to the subject site or other local data (i.e. some local farmers may keep records);
- Records of *A. parapulchella*: a standardised sampling effort should be established based on foraging time or the number of rocks lifted and searched.
- Floristic structure: 20m x 20m monitoring plots using BioBanking Assessment Methodology (2008).
- Ant diversity and abundance: series of permanent pitfall traps opened for a 36 hour period.

5.6 CONCLUSION

The subject site contains valuable habitat for *A. parapulchella*. It is likely that this habitat was once much more widespread in the local area, but has now been reduced due to the encroachment of agricultural development. It is promising however that *A. parapulchella* has survived within the subject site despite the surrounding disturbance.

The implementation of 'well thought out' land management practises within the subject site may ensure that local populations of *A. parapulchella* are protected and enhanced.

KLEINFELDER
Bright People. Right Solutions.

6. REFERENCES

Beattie, A & Oliver, I. (1994). "Taxonomic Minimalism", Trends in Ecology and Evolution, 9, pp. 488490.

Biobanking Assessment Methodology. (2008). Department of Environment and Climate Change NSW. Goulburn Street, Sydney.

Elliot, G.L. and Veness, R.A. (1981). Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley, J. Soil Cons. NSW 37 37-40.

Harden, G.J. (ed) (1992). Flora of New South Wales Volume 3. NSW University Press: Sydney.

Harden, G.J. (ed) (1993). Flora of New South Wales Volume 4. NSW University Press: Sydney.

Harden, G.J. (ed) (2000). Flora of New South Wales Volume 1. NSW University Press: Sydney.

Harden, G.J .(ed) (2002). Flora of New South Wales Volume 2. NSW University Press: Sydney.

Jones, S. (1992) Habitat Relationships, Diet and Abundance of the Endangered Pygopodid, Aprasia parapulchella in the Australia Capital Territory and Surrounding New South Wales. Canberra, University of Canberra.

Jones, S. (1999) Conservation Biology of the Pink- tailed Legless Lizard Aprasia arapulchella. Canberra, University of Canberra.

Macbeth (1994). Munsell Soil Colour Charts. Revised Edition.

Majer, J.D., Orabi, G., Bisevac, L. 2007. Ants (Hymenoptera: Formicidae) pass the bioindicator scorecard. Myrmecological News. 10, 69-76.

Michael, D. & Herring, M. (2005) Habitat of the Pink- tailed Worm Lizard Aprasia parapulchella in Albury, NSW. Herpetofauna. 35, 103- 111.

Oliver, I, Dangerfield, M & York, A (1999) "When and how to conduct a biodiversity assessment of terrestrial invertebrates" in The Other 99%: The Conservation and Biodiversity of Invertebrates, Royal Zoological Society of New South Wales, NSW.

Osborne, W., Lintermans, M. & Williams, K. (1991) Distribution and Conservation Status of the Endangered Pink- tailed Legless Lizard (Aprasia parapulchella) (Kluge). Research Report 5. Canberra, ACT Parks and Conservation Service.

Osborne, W., Lintermans, M. & Williams, K. (1993) Distribution, Population Density and Habitat of the Pink- tailed Legless Lizzard (Aprasia parapulchella) in Canberra Nature Park. Technical Report No. 3. Canberra, ACT Parks and Conservation Service.

Robertson, P. & Heard, G. (2008) Report on Field Surveys for the Pink- tailed Worm Lizard (Aprasia parapulchella) in the Bendigo Region, Central Victoria: Distribution, Habitat, Associations and Population Attributes. Report Prepared for Department of Sustainability and Environment. Victoria, Wildlife Profiles Pty Ltd.

Wong, D., Jones, S.R., Osborne, W.S., Brown, G.W., Robertson, P., Michael, D.R. & Kay, G.M. (2011) The Life History and Ecology of the Pink Tailed Worm Lizard Aprasia parapulchella Kluge – A Review. Australian Zoologist, 35.

KLEINFELDER
Bright People. Right Solutions.

APPENDIX 1: ECOLOGY OF ANT GENERA

Iridomyrmex
Iridomyrmex is one of the largest and most frequently encountered groups of ants in Australia. They are also one of the most ecologically important groups as they interact strongly with many other invertebrates as well as many plants. Iridomyrmex species frequently form large nests which are patrolled by aggressive workers. This can significantly reduce the number of other species which can nest or forage in the area. Sometimes the only species which can co-exist with Iridomyrmex are those which forage at different times of the day or differ in size compared with Iridomyrmex species, and thus "escape" interactions with the Iridomyrmex workers. Nests are located in soil, with or without covering, and range in size from a few hundred to over 300,000 workers. The above-ground structure of nests varies from large mounds decorated with small pebbles and having many entrances to single, cryptic holes just large enough for individual workers to squeeze through. Several species in southern Western Australia alternate between two distinct nest types. In the cool winter months they construct above ground twig nests in open areas, while in the hot summer months they move to below ground nests in shaded areas. Colonies of meat ants (Iridomyrmex purpureus group) are often spread over wide areas with many individual nests connected by well-defined paths. In some cases these "super nests" can stretch up to 650 metres.
Rhytidoponera
These are some of the most common ants in Australia but are less common elsewhere. They are found throughout Australia and can be very abundant, especially in urban areas such as yards, gardens and parks. Some species, especially those found in forested areas; generally forage during the day while many of the arid zone species forage primarily in the evening and at night. In forested areas they will forage on low vegetation and trees as well as on the ground. They are general predators or scavengers, with some also taking honeydew and others showing a strong preference for seeds. Workers generally forage singly or less often in small groups. Some of the smaller species have a potent sting while others, including the larger species, have a weak sting or are unable to sting. Nests are generally in soil either in the open or under rocks or other objects on the ground. When in the open, nests range from low and messy mounds to large mounds decorated with stones and small twigs or leaves. Species found in wet sclerophyll and rainforest often nest in rotten wood. Some rainforest species will occasionally nest arboreally (although they nest on the ground as well). Most species lack queens and instead have fertilised workers which produce brood. In some, where true queens are present, the queens may be replaced by fertilised workers when they die.
Camponotus
This is one of the largest, most common and widespread groups of ants in the world and can be found in essentially all habitats and areas where ants occur. Nests are found in a wide range of sites including in soil with or without coverings, between rocks, in wood, among the roots of plants and in twigs on standing shrubs or trees. Some species will also nest in close association with other ants such as Iridomyrmex in Australia. Foraging times vary among species, with some found only during the day and others found only at night while others will forage at all times. Some of the nocturnal species will show little or no evidence of their presence during the day, but once night arrives, they can be found in large numbers on the ground or on low vegetation. They are general scavengers and predators and will collect nectar and plant secretions and tend Hemiptera for honeydew. They are also known to harbor Hemiptera in their nests during the day, protecting them from predators. At night workers carry their guests into trees and shrubs and allow them to feed, thus producing honeydew which is collected by the ants. In a number of arid zone species selected workers act as living

KLEINFELDER
Bright People. Right Solutions.

storage vessels. These special workers, called repletes, include the well-known honey-pot ants. They receive fluids from returning foragers, expanding their gasters until they are many times larger than normal. They become so swollen that leaving the nest is impossible and they remain inside, hanging from the ceiling of the nest chambers. Other species of Camponotus are closely associated with butterflies, the caterpillars of some species being found only in the nests of these ants.

Melophorus

These ants are common in most areas of Australia with the exception of cool, wet areas. Foraging is strictly during the day, and in the arid zone they are one of the only ants active during the hottest part of the day. Some species reduce foraging activity during the winter, although in cooler areas most species will forage on warmer winter days. They are omnivores and some collect seeds. Some species have become highly modified with very flattened bodies, presumably to allow foraging in small, thin crevices. A few are also known to prey on the larvae and pupae of meat ants in the genus Iridomyrmex. All species are ground nesting in the open, often with a small amount of dirt near the entrance. Workers of Melophorus are some of the fastest and most timid ants in Australia. On hot days they can run so rapidly that they can be difficult to capture. They are also so shy that the slightest disturbance near a nest will cause workers to disperse or disappear into the nest, only returning or becoming active again after many minutes.

Notoncus

Nests of these common ants are found in open soil or under stones and logs on the ground. They are general predators, foraging on the ground surface. Although active all year, in some areas they can be more active during the winter. They are common in urban gardens and parks.

Opisthopsis

Opisthopsis is a very distinctive group of ants and can be found in large numbers in appropriate habitats. The workers are generally brightly coloured and forage on the ground as well as on vegetation. They run rapidly with short, jerky motions and are often out during the hottest part of the day. Being equipped with large eyes their vision is very acute and capturing foragers can be challenging. They will skip out of harm's way when approached on the ground or dart to the far side of a branch or leaf if foraging on vegetation.

Nests are either in the soil or in branches on trees or large shrubs. Ground nests are often in active termite mounds or in larger ant nests such as those of some Rhytidoponera species. Colonies generally contain at most several hundred workers and a single or several queens.

Two species of Opisthopsis have so far been found only in the nests of other species of the genus. It is suspected that these are parasitic species using other Opisthopsis species to raise their young, but detailed studies are yet to be undertaken.

Polyrachis

Within its range, Polyrhachis is one of the more common groups of ants. They nest in open soil or in soil under rocks and logs, in holes in standing trees and a few tropical species form arboreal nests made of plant fibres (carton) and larval silk. Most of the ground nesting species form inconspicuous nests but at least one in arid Australia (the mulga ant, P. macropa) forms large mounds decorated with dried leaves. Polyrhachis also contains the only known marine ants in the world. The species P. constricta and P. sokolova nest in mangrove mud flats which are subject to tidal flooding. They retreat into their nests as the tide advances, foraging in mangroves only during low tide when their nests are exposed.

Species are omnivorous and will collect nectar. Most are fairly timid and will retreat when disturbed. Some of the arboreal species will bang their bodies against the walls of their nests when disturbed, producing a distinct, loud rattling noise. Many are nocturnal, especially in arid areas, while others forage during the day.

KLEINFELDER
Bright People. Right Solutions.

Myrmecia
Species of Myrmecia forage on the ground or on low vegetation, primarily during the day but a few will also forage at night. They collect nectar and plant juices as well as animal prey, the latter being fed to their larvae. Most species nest in soil, often with a mound which is sometimes covered with pebbles or plant fragments. A few species nest in rotten logs and one northern rainforest species nests arboreally in epiphytic ferns. Most nests are small with only a few hundred workers but some groups commonly have up to a few thousand workers. They are aggressive and have a very potent sting and well developed vision. They will freely chase intruders away from their nests. The larger species can run rapidly across the ground or through vegetation while the smaller "jack jumpers" can cover ground very quickly using a rapid series of short jumps. Having several dozen large ants poring out of a disturbed nest, with jaws open and stings ready and heading straight for the intruder, is more than sufficient to discourage even the most determined collector. Their stings can cause severe allergic reactions in some individuals, even causing death in some cases.
Crematogaster
Crematogaster workers are moderately aggressive and will attack when disturbed. They have well developed chemical defences and are avoided by most other ants. Often small white droplets of defensive compounds can be seen at the tip of the upheld gaster in disturbed workers. Nests are found in a range of sites including in soil with or without coverings, in cracks in rocks, in dead wood and arboreally in trunks and twigs; a few will construct silk nests in trees. Nests can contain many thousands of workers but most are more moderately sized. Individual colonies are often composed of several small nests a few metres apart and may contain more than one queen. The entrances of these separate nests can sometimes be connected by well-worn trails several centimetres deep. Additionally, some ground nesting species will form small satellite nests under bark on trees to protect and guard the Hemiptera from which they collect honeydew. Foraging takes place on the ground as well as on low vegetation and trees, and often involves distinct trails. They are generalist predators as well as tending Hemiptera and the caterpillars of several butterflies.
Meranoplus
These common ants are ground nesting, with or without covering, sometimes with a mound of low dirt or a large depression around the entrance, and often with piles of discarded seeds or seed coats nearby. Workers are slow moving, foraging on the ground and occasionally on tree trunks, primarily during the day but also at night. When disturbed many species retract their legs and curl their gasters under themselves to form a compact ball, lying motionless to avoid detection. While most species are generalist scavengers some specialise on seeds. They are also attracted to tuna baits as well as honey baits on trees.

KLEINFELDER
Bright People. Right Solutions.

Pheidole

This is one of the most common groups of ants in warmer regions of the world. Most species nest in soil with a low mound of loose dirt around the entrance. These nests are often very active with many workers carrying soil from the nest and foraging in the immediate vicinity. This can makes nests highly visible. Other species nest under rocks or in plant roots while a few occasionally nest arboreally. Some rainforest species nest in rotten wood on the ground. Foraging is most common on the ground and large numbers of workers can be found at highly desirable food sources such as honey baits. In the tropics most foraging takes place during the late afternoon and throughout the night while in cooler regions foraging occurs at all times of the day and night. Well defined foraging trails are sometimes established between nests and food sources. A wide range of food is taken as these ants are seed harvesters as well as general predators and scavengers; they also collect honeydew from Hemiptera and plant fluids including nectar. When feeding on seeds they can take large numbers very rapidly. Division of labour is well developed in these ants. Major workers, which make up about 10% of all workers, rarely venture far from the nest and are involved with defence as well as dissecting large food items. Minor workers undertake most of the foraging and nest construction. P. megacephala is a pest introduced to many areas. It can pose a serious threat to local invertebrate communities as it will severely reduce or eliminate natives insects, especially other ants, with which it comes in contact. A few species are known to be inquilines in the nests of other Pheidole species.

Fossils are known from the Oligocene (35-25 million years before present).

APPENDIX 2: SOIL LABORATORY TEST METHODS

Particle Size Analysis

Determination by sieving and hydrometer of percentage, by weight, of particle size classes: Gravel >2mm, Coarse Sand 0.2-2 mm, Fine Sand 0.02-0.2 mm, Silt 0.002-0.2 mm and Clay <0.002 mm SCS Standard method. Reference - Bond, R, Craze B, Rayment G, and Higginson (in press 1990) Australia Soil and Land Survey Laboratory Handbook, Inkata Press, Melbourne.

Emerson Aggregate Test

An eight class classification of soil aggregate coherence (slaking and dispersion) in water. SCS Standard Method closely related to Australian Standard AS1289. The degree of dispersion is included in brackets for class 2 and 3 aggregates. Reference -Bond R., Craze, B., Rayment, G., Higginson, F.R., (in press 1990). Australian Soil and Land survey Laboratory Handbook, Inkata Press, Melbourne.EC

The eight classes and their properties are:

- Class 1 - very dispersible soils with a high tunnel erosion susceptibility.
- Class 2 - moderately dispersible soils with some degree of tunnel erosion susceptibility.
- Class 3 - slightly or non-dispersible soils which are generally stable and suitable for soil conservation earthworks.
- Class 4-6 - more highly aggregated materials which are less likely to hold water. Special compactive efforts are required in the construction of earthworks.
- Class 7-8 - highly aggregated materials exhibiting low dispersion characteristics.

The following subdivisions within Emerson classes may be applied:

- slight milkiness, immediately adjacent to the aggregate
- obvious milkiness, less than 50% of the aggregate affected
- obvious milkiness, more than 50% of the aggregate affected
- total dispersion, leaving only sand grains.

KLEINFELDER
Bright People. Right Solutions.

Salinity

Salinity is measured as electrical conductivity on a 1:5 soil:water suspension to give EC (1:5). The effects of salinity levels expressed as EC at 25o (dS/cm), on plants are:

- 0 to 1 very low salinity, effects on plants mostly negligible.
- 1 to 2 low salinity, only yields of very sensitive crops are restricted.
- > 2 saline soils, yields of many crops restricted.

pH

Determined on a 1:5 soil:water suspension. Soil refers to the fine earth fraction of the sample. Reference - Bond, R., Craze, B., Rayment, G., Higginson, F.R. (in press 1990). Australian Soil and Land Survey Handbook. Inkata Press, Melbourne.

Phosphorus

The Bray phosphorus method extracts plant available phosphorus from the soil matrix using fluoride after centrifugation. Reference - Bond, R., Craze, B., Rayment, G., Higginson, F.R. (in press 1990). Australian Soil and Land Survey Handbook. Inkata Press, Melbourne.

Phosphorus Absorption

A standard phosphorus solution is added to a soil. After equilibrium the phosphorus remaining in solution is measured colorimetrically and the phosphorus "fixed" by the soil determined by difference. Reference – Abott TS (1987) BCRI Soil Testing Methods.

Cation Exchange Capacity

CEC and exchangeable cations are determined by a single extraction using unbuffered (AgTU)+. Reference - Bond, R., Craze, B., Rayment, G., Higginson, F.R. (in press 1990). Australian Soil and Land Survey Handbook. Inkata Press, Melbourne.

APPENDIX 3: STAFF CONTRIBUTIONS AND LICENSING

The following staff were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Dr. Gilbert Whyte	PhD	Senior Ecologist (Botanist/Entomologist)	Field Surveys and Report Writing
Chelayne Evans	B.Sc. Geo (Hons 1)	Operations Manager	Report Review
Dr. Steve Shattuck	PhD	Research Scientist (CSIRO)	Ant Identification (Species level)

Kleinfelder employees involved in the current study are licensed or approved under the National Parks and Wildlife Act 1974 (License Number: SL100730, Expiry: 31st March 2014) and the Animal Research Act 1985 to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.

This page has been intentionally left blank

Appendix B

Habitat Ratings for Potential Habitat Areas using Habitat Assessment Scheme

This page has been intentionally left blank

Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		/1
	Well-Draining Soil	Sandy Loam = 2	/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	/1
		Ant nests present = 1	
		Total	**/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

High Quality Habitat = 20-25
Medium Quality Habitat = 14-19
Low Quality Habitat = 8-13
No Habitat = 0-7

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	3/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	5/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**23/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 1a **23/25** **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**19/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 1b 19/25 **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**18/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 2a **18/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		0/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	1/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**15/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 2b **15/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	5/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**22/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 2c **22/25** **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	3/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**11/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 3a **11/25** **Low Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**15/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 3b **15/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**20/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 3c **20/25** **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**15/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 3d 15/25 Medium Quality Habitat

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	3/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	1/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**17/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4a **17/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	1/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**10/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4b **10/25** **Low Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	2/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	3/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	5/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**20/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4c **20/25** **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	2/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**17/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4d **17/25** **Medium Quality**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**20/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 4e **20/25** **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**16/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 5 **16/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		0/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**19/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 6a **19/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**21/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 6b 21/25 **High Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	1/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	1/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**11/25**
Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			

Area 7 **11/25** **Low Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	3/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**15/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 8 **15/25** **Medium Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	1/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	1/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**13/25**
Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand			
Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.			

Area 9 **13/25** **Low Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	0/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 1	1/2
		Sandy Clay Loam = 2	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	2/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock[1]	No suitable rocks present = 0	1/5
		Occasional suitable rocks present = 1	
		<6 or >10 suitable rocks present (per 10m^2) = 3	
		6-10 suitable rocks present (per 10m^2) = 5	
The occurrence of A parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on sedimentary rocks and never on alluvial soils	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests[2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**13/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 10a **13/25** **Low Quality Habitat**

Habitat Indicators	Weighting Method		Overall Weighting
Although the habitat of *A. parapulchella* is thought to be relatively specific, individuals have been collected in habitats considered less than ideal. *Record of Presence* are therefore the most important indicator of habitat quality and is therefore given the greatest weighting.	History of Identification	Record <50 years = 1	5/5
		Record <20 years = 2	
		Record <10 years = 3	
		Record <5 years = 4	
		Record <2 years = 5	
A. parapulchella has strong associations with sloping, well drained, open landscapes characterised by outcroppings of lightly embedded surface rocks (Wong 2011).	Moderate Slope Present = 1		1/1
	Well-Draining Soil	Sandy Loam = 2	1/2
		Sandy Clay Loam = 1	
A. parapulchella prefers a grassy ground layer with little to no leaf litter, and relatively low tree and shrub cover (Osborne et al 1991; Osborne and McKergow 1993; Michael and Herring 2005; Robertson and Heard 2008).	Absence of Dense Canopy Coverage	<60% Canopy Coverage = 1	3/3
		<40% Canopy Coverage = 2	
		<20% Canopy Coverage = 3	
A high diversity and abundance of native grasses such as Kangaroo Grass (*Themeda australis*) is also an indicator of habitat quality (Osborne and McKergow 1993; Jones 1999; Osborne 1991	Diverse Grassy Groundcover	>25% Coverage or > 3 grass species (20 x 20 Area) = 1	2/3
		>50% Coverage or > 6 grass species (20 x 20 Area) = 2	
		>75% Coverage or > 10 grass species (20 x 20 Area) = 3	
Surface rocks are believed to be important for thermoregulation of *A. parapulchella* (thigmothermy: gaining heat from contact within the underside of surface rocks) (Jones 1992)	Loose Surface Rock [1]	No suitable rocks present = 0	3/5
		Occasional suitable rock present = 1	
		<6 or >10 suitable rocks present (per $10m^2$) = 3	
		6-10 suitable rocks present (per $10m^2$) = 5	
The occurrence of A. parapulchella appears to be correlated to the underlying geology with most occurrences on intermediate volcanics. Records suggest that A. parapulchella is sometimes found whre the underlying geology is basalt, almost never on	Underlying Geology	Alluvial = 0	5/5
		Sedimentary = 1	
		Basalt = 3	
		Intermediate Volcanics (trachyte) = 5	
The diet of *A. parapulchella* consists almost exclusively of ant broods (Web and Shine 1994; Wong 2011)	Presence of ant nests [2]	Ant nests absent = 0	1/1
		Ant nests present = 1	
		Total	**21/25**

Note 1: Suitable surface rocks are those roughtly dinner plate in size which are readily turned over by hand

Note 2: The importance of ants as a feed source for the A. parapulchella is acknowledged, however, as the relative importance of ant species or density of ants is unknown, further detailed scoring is not able to be completed at this time. In any event, it is considered likely that the factors influencing the occurence of A. parapulchella are likely to similarly influence the ant species or collection of ant species on which A. parapulchella feeds, hence to attribute any further weighting to the occurrence of ants could be a form of double counting.

Area 10b	**21/25**	**High Quality Habitat**

High Quality Habitat = 20-25
Moderate Quality Habitat = 14-19
Low Quality Habitat = 8-13
No Habitat = 0-7

Area	Score	Quality
Area 1a	23/25	High Quality Habitat
Area 1b	19/25	Moderate Quality Habitat
Area 2a	18/25	Moderate Quality Habitat
Area 2b	15/25	Moderate Quality Habitat
Area 2c	22/25	High Quality Habitat
Area 3a	11/25	Low Quality Habitat
Area 3b	15/25	Moderate Quality Habitat
Area 3c	20/25	High Quality Habitat
Area 3d	15/25	Moderate Quality Habitat
Area 4a	17/25	Moderate Quality Habitat
Area 4b	10/25	Low Quality Habitat
Area 4c	20/25	High Quality Habitat
Area 4d	17/25	Moderate Quality
Area 4e	20/25	High Quality Habitat
Area 5	16/25	Moderate Quality Habitat
Area 6a	19/25	Moderate Quality Habitat
Area 7	11/25	Low Quality Habitat
Area 8	15/25	Moderate Quality Habitat
Area 9	13/25	Low Quality Habitat
Area 10a	13/25	Low Quality Habitat
Area 10b	21/25	High Quality Habitat

Area	Score	Quality
Area 4b	10/25	Low Quality Habitat
Area 3a	11/25	Low Quality Habitat
Area 7	11/25	Low Quality Habitat
Area 9	13/25	Low Quality Habitat
Area 10a	13/25	Low Quality Habitat
Area 2b	15/25	Moderate Quality Habitat
Area 3b	15/25	Moderate Quality Habitat
Area 3d	15/25	Moderate Quality Habitat
Area 8	15/25	Moderate Quality Habitat
Area 5	16/25	Moderate Quality Habitat
Area 4d	17/25	Moderate Quality Habitat
Area 4a	17/25	Moderate Quality Habitat
Area 2a	18/25	Moderate Quality Habitat
Area 1b	19/25	Moderate Quality Habitat
Area 6a	19/25	Moderate Quality Habitat
Area 3c	20/25	High Quality Habitat
Area 4e	20/25	High Quality Habitat
Area 4c	20/25	High Quality Habitat
Area 10b	21/25	High Quality Habitat
Area 2c	22/25	High Quality Habitat
Area 1a	23/25	High Quality Habitat

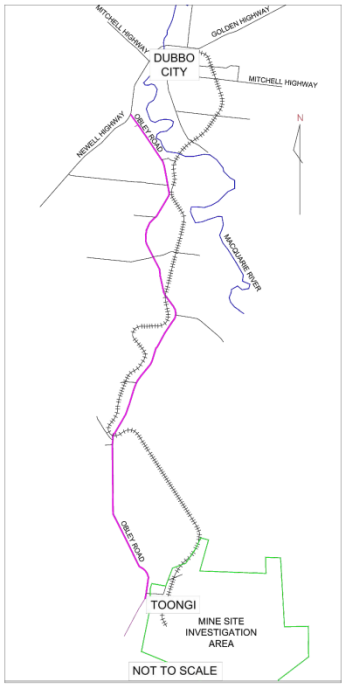
This page has been intentionally left blank

APPENDIX 14: OBLEY ROAD AND CULVERT CROSSING DESIGN DETAIL*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT DESIGN



SHEET INDEX	
SHEET NUMBER	**DESCRIPTION**
201205-1	COVER SHEET & SHEET INDEX
201205-2	OVERVIEW PLAN OF ALIGNMENT
201205-3	EXISTING CONDITIONS & INTERSECTION PLAN CH 0 - CH 3900
201205-4	INTERSECTIONS 1 & 2 PROPOSED TREATMENTS DETAIL SHEET
201205-5	EXISTING CONDITIONS & INTERSECTION PLAN CH 3900 - CH 7800
201205-6	INTERSECTIONS 3 & 4 PROPOSED TREATMENTS DETAIL SHEET
201205-7	EXISTING CONDITIONS & INTERSECTION 5 PLAN CH 7800 - CH 10250
201205-8	EXISTING CONDITIONS & INTERSECTION PLAN CH 10000 - CH 16000
201205-9	INTERSECTION 6 PROPOSED TREATMENT DETAIL SHEET
201205-10	INTERSECTIONS 7 & 8 PROPOSED TREATMENTS DETAIL SHEET
201205-11	EXISTING CONDITIONS & INTERSECTION PLAN CH 16000 - CH 21300
201205-12	EXISTING CONDITIONS & INTERSECTION 9 TREATMENT PLAN CH 21300 - CH 21750

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK
B	11-12-2012	DB	ISSUED FOR REVIEW	MB
A	04-09-2012	DB	ISSUED FOR REVIEW	

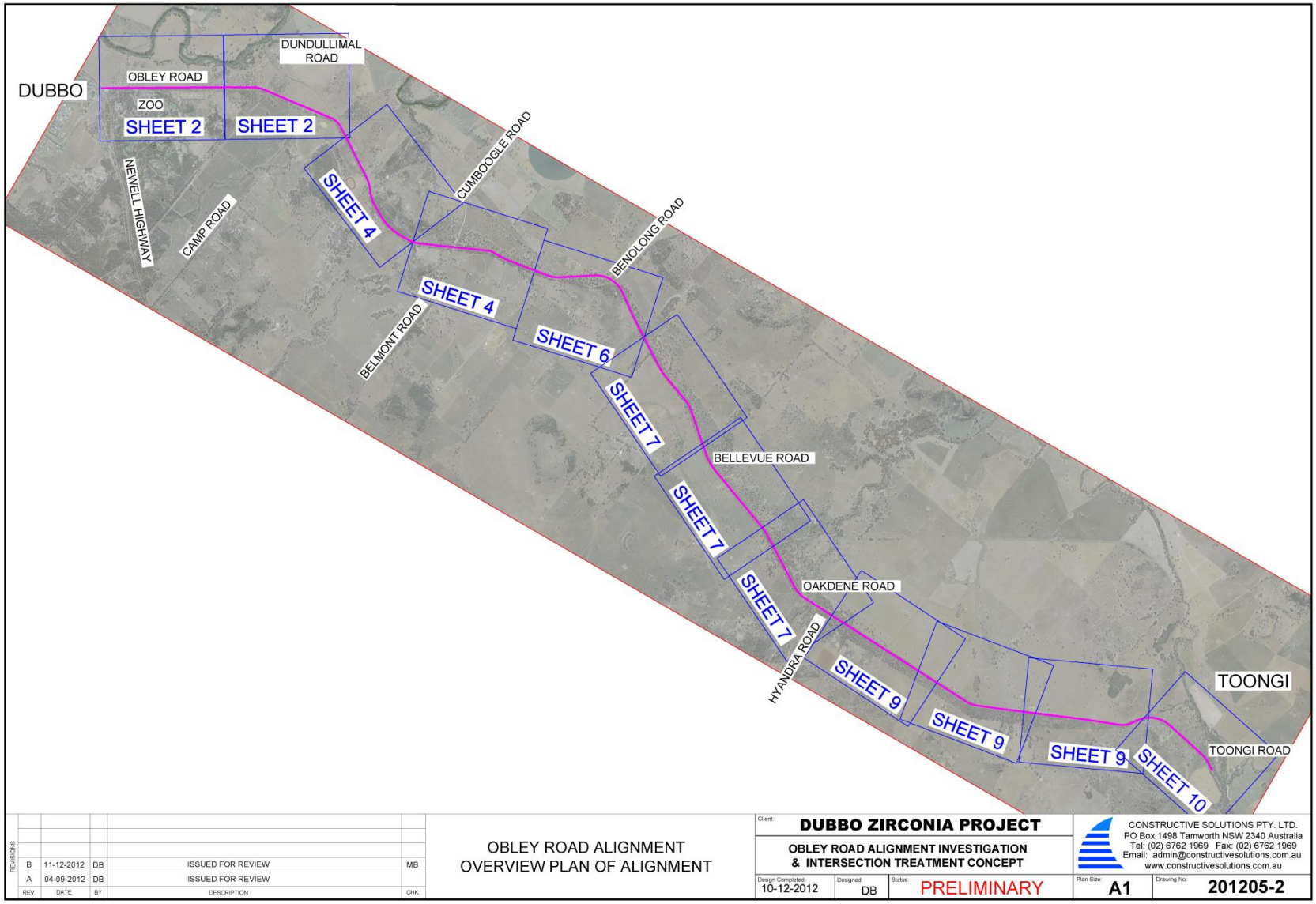
COVERSHEET & SHEET INDEX

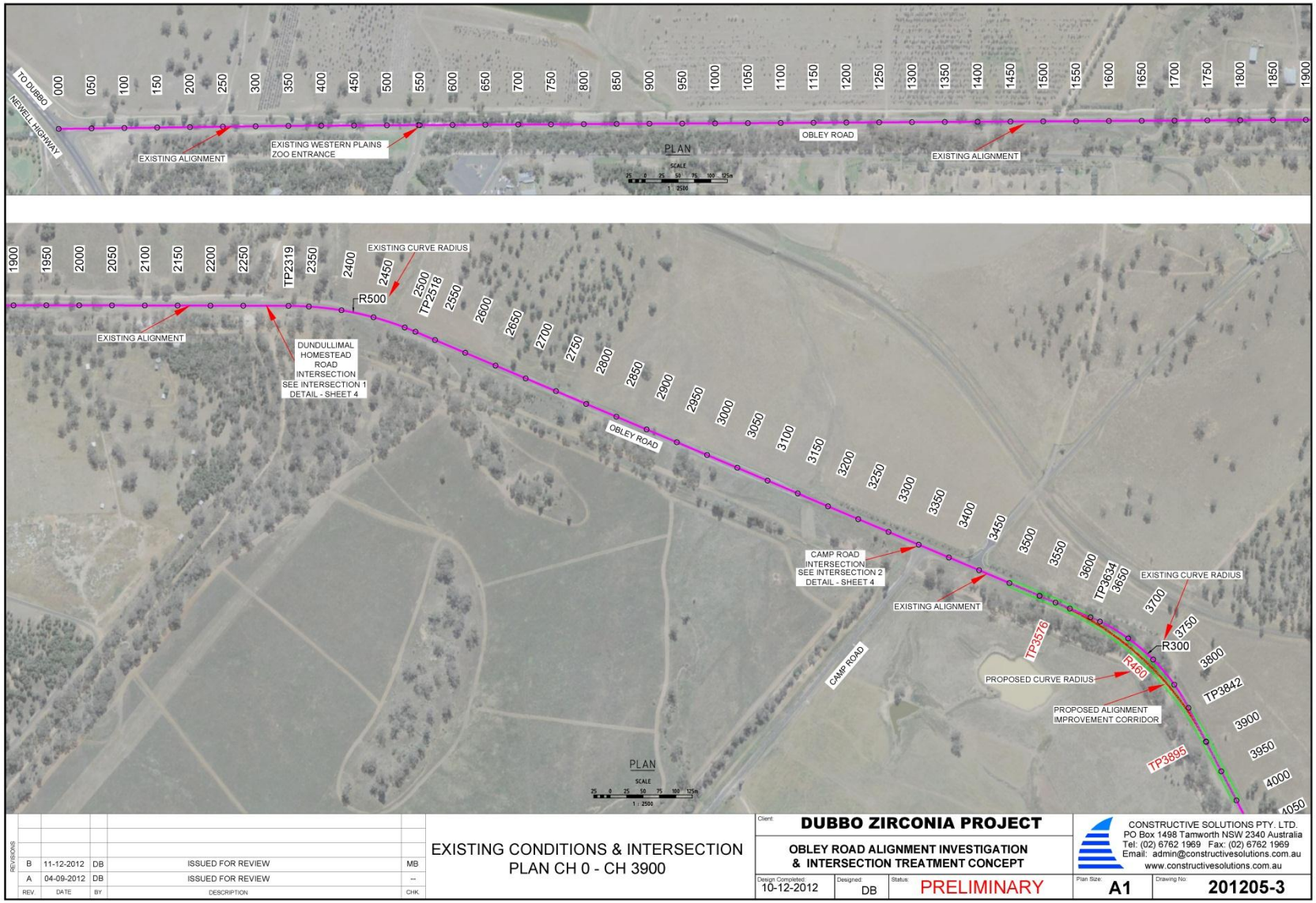
Client: **DUBBO ZIRCONIA PROJECT**

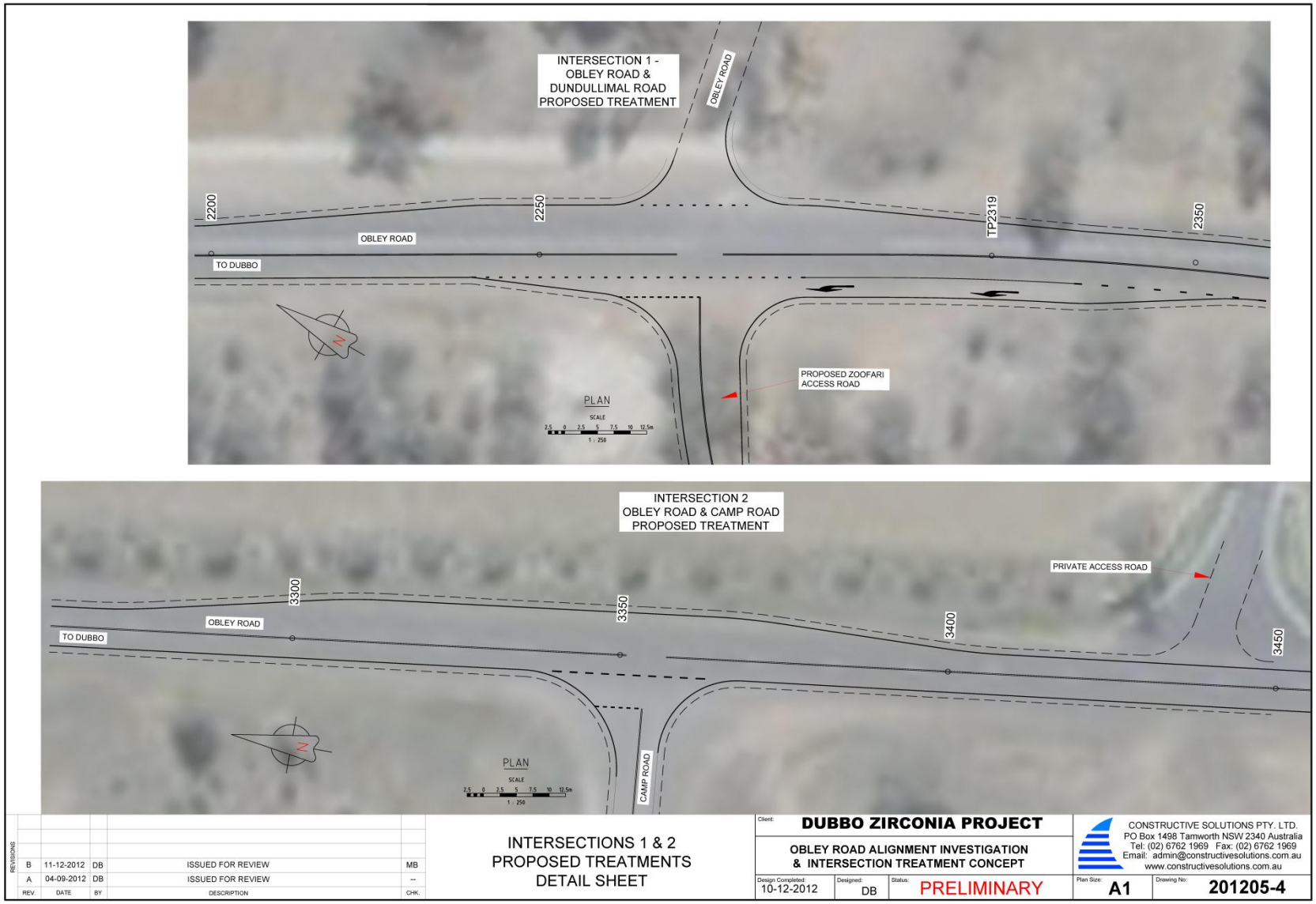
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT

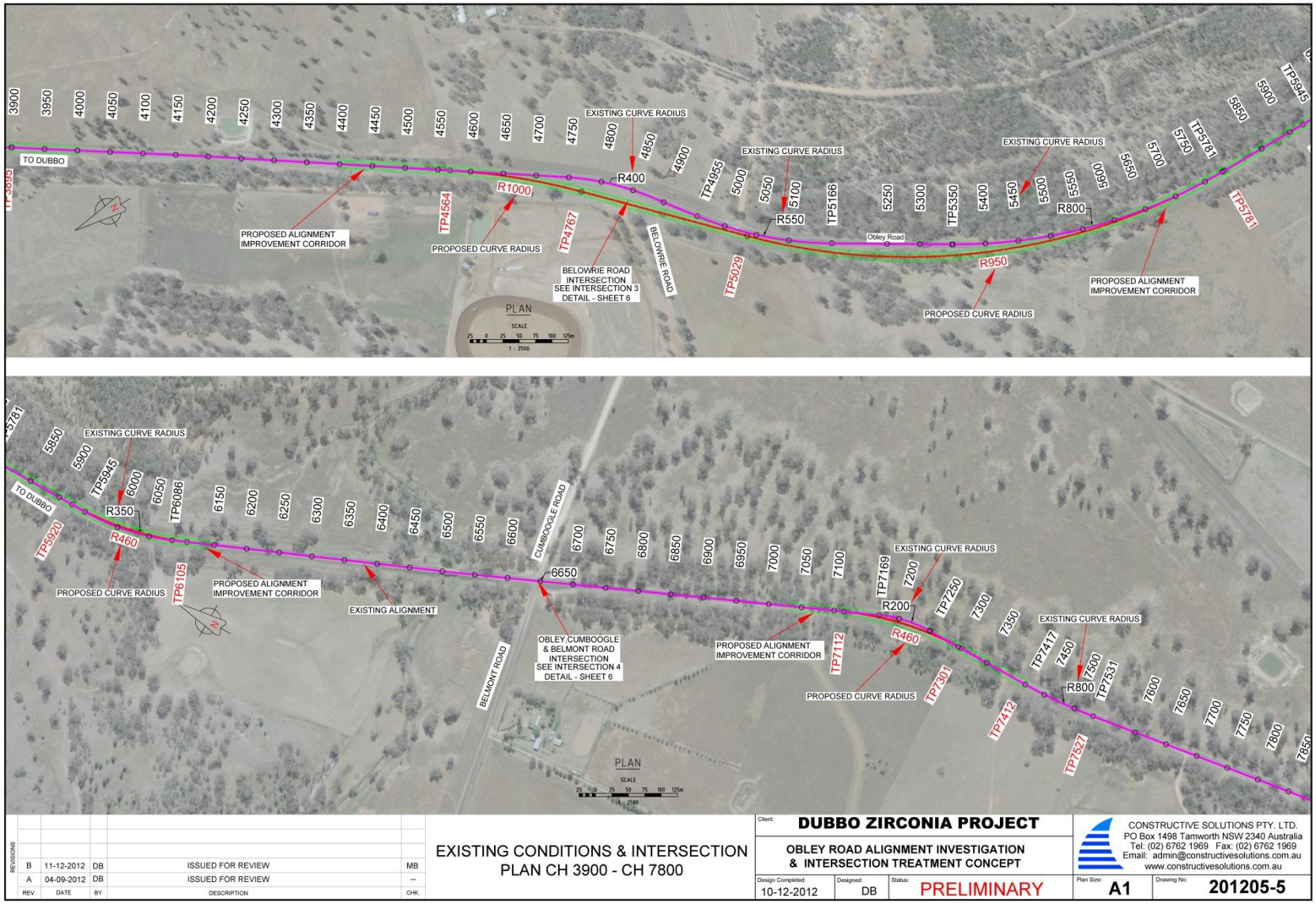
Design Completed: 10-12-2012 | Designed: DB | Status: PRELIMINARY | Plan Size: A1 | Drawing No: 201205-1

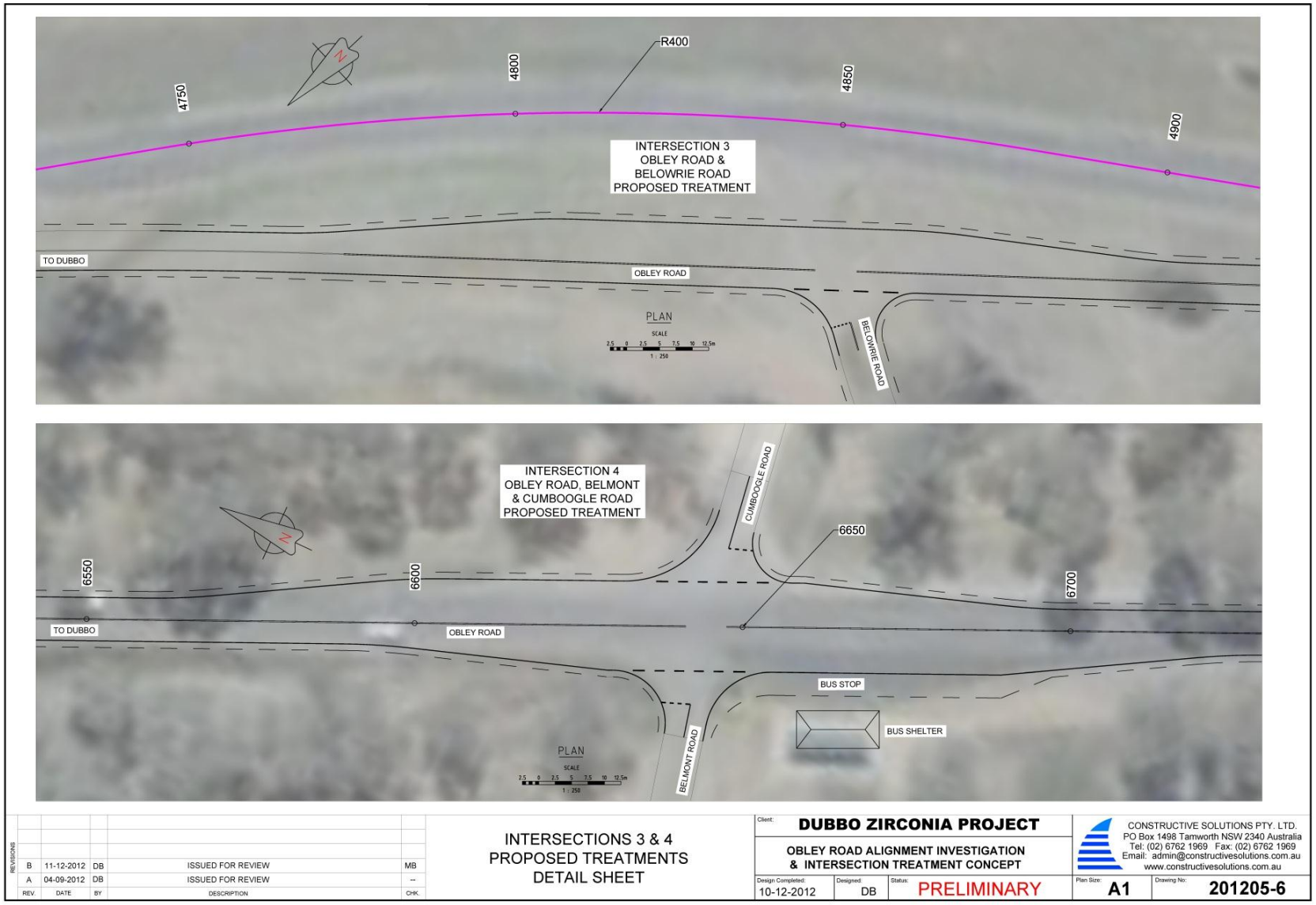
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au

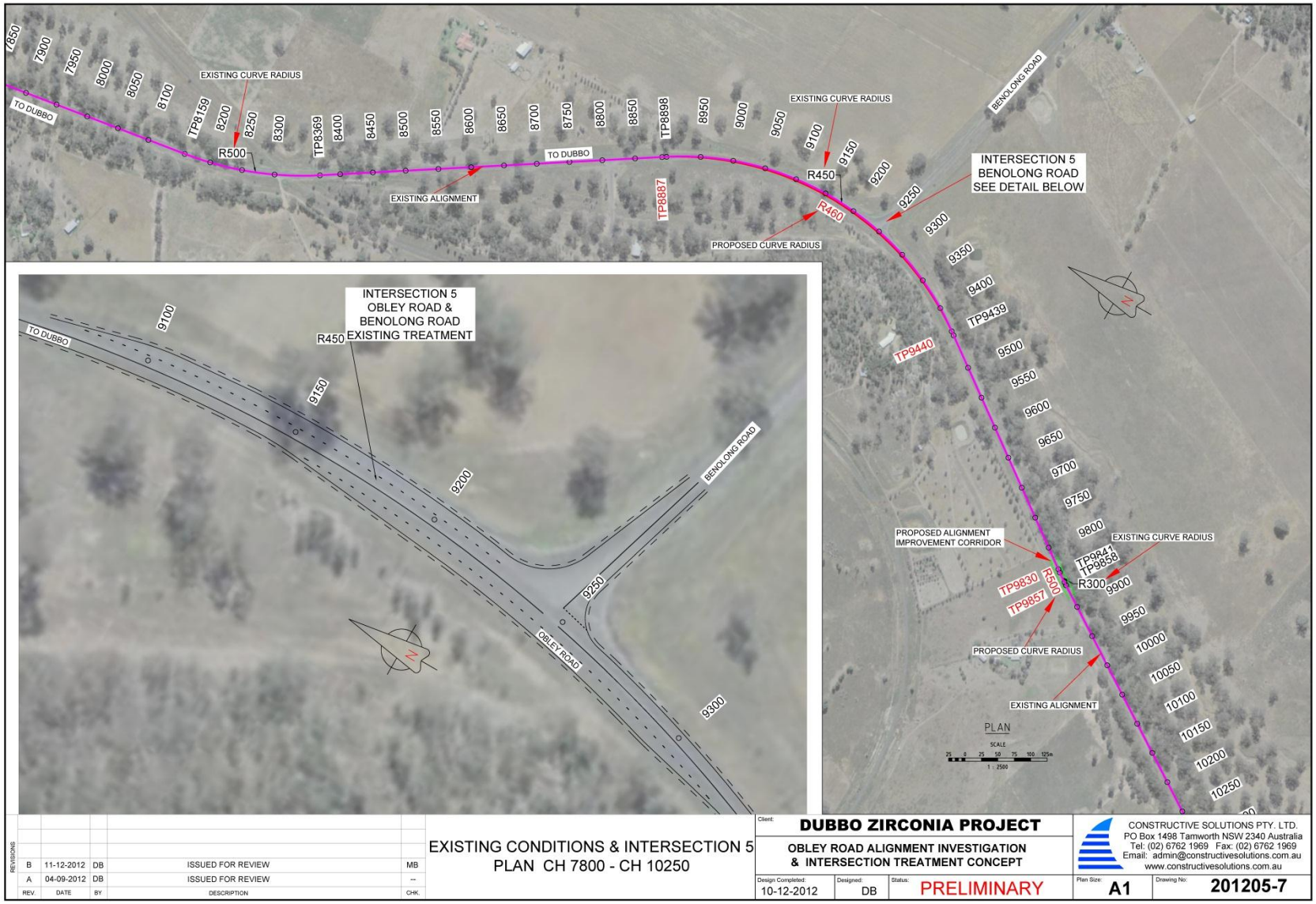

DUBBO
OBLEY ROAD
ZOO
DUNDULLIMAL ROAD
SHEET 2
SHEET 2
NEWELL HIGHWAY
CAMP ROAD
SHEET 4
CUMBOOGLE ROAD
BENOLONG ROAD
SHEET 4
BELMONT ROAD
SHEET 6
SHEET 7
BELLEVUE ROAD
SHEET 7
SHEET 7
OAKDENE ROAD
HYANDRA ROAD
SHEET 9
SHEET 9
SHEET 9
TOONGI
TOONGI ROAD
SHEET 10
REVISIONS
REV. | DATE | BY | DESCRIPTION | CHK
B | 11-12-2012 | DB | ISSUED FOR REVIEW | MB
A | 04-09-2012 | DB | ISSUED FOR REVIEW
OBLEY ROAD ALIGNMENT
OVERVIEW PLAN OF ALIGNMENT
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-2

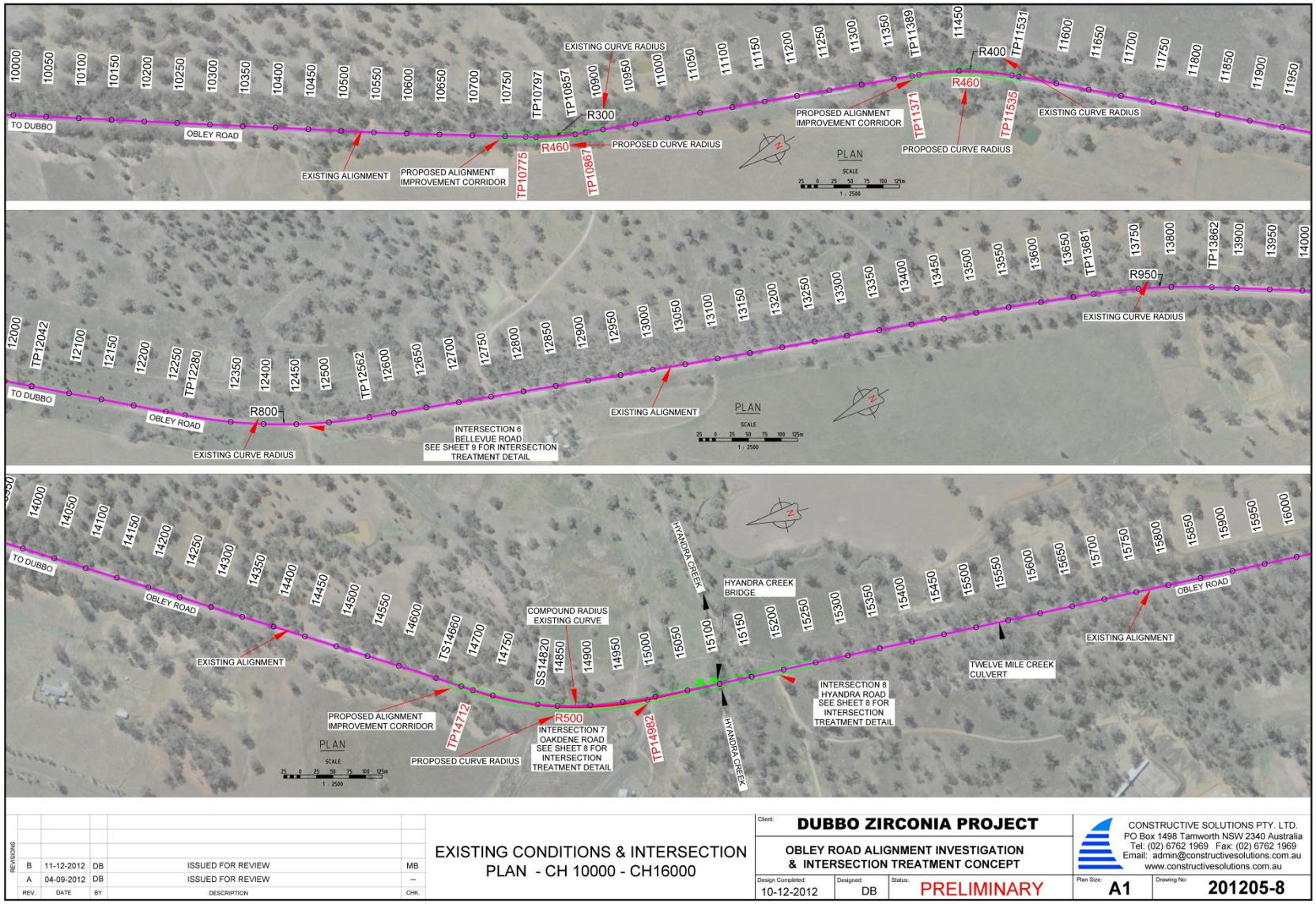

TO DUBBO
NEWELL HIGHWAY
EXISTING ALIGNMENT
EXISTING WESTERN PLAINS ZOO ENTRANCE
PLAN
OBLEY ROAD
EXISTING ALIGNMENT
EXISTING CURVE RADIUS
R500
TP2518
TP2319
EXISTING ALIGNMENT
DUNDULLIMAL HOMESTEAD ROAD INTERSECTION SEE INTERSECTION 1 DETAIL - SHEET 4
OBLEY ROAD
CAMP ROAD INTERSECTION SEE INTERSECTION 2 DETAIL - SHEET 4
EXISTING ALIGNMENT
TP3576
TP3634
EXISTING CURVE RADIUS
R300
R460
PROPOSED CURVE RADIUS
PROPOSED ALIGNMENT IMPROVEMENT CORRIDOR
TP3842
TP3895
CAMP ROAD
PLAN
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK
EXISTING CONDITIONS & INTERSECTION PLAN CH 0 - CH 3900
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-3
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au


INTERSECTION 1 -
OBLEY ROAD &
DUNDULLIMAL ROAD
PROPOSED TREATMENT
OBLEY ROAD
2200
2250
TP2319
2350
OBLEY ROAD
TO DUBBO
PROPOSED ZOOFARI
ACCESS ROAD
PLAN
SCALE
1 : 250
INTERSECTION 2
OBLEY ROAD & CAMP ROAD
PROPOSED TREATMENT
PRIVATE ACCESS ROAD
3300
3350
3400
3450
OBLEY ROAD
TO DUBBO
CAMP ROAD
PLAN
SCALE
1 : 250
REVISIONS
REV. DATE BY DESCRIPTION CHK.
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
INTERSECTIONS 1 & 2
PROPOSED TREATMENTS
DETAIL SHEET
Client:
DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION
& INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-4
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au


TO DUBBO
EXISTING CURVE RADIUS
R400
R1000
R550
R800
R950
PROPOSED ALIGNMENT IMPROVEMENT CORRIDOR
PROPOSED CURVE RADIUS
BELOWRIE ROAD INTERSECTION SEE INTERSECTION 3 DETAIL - SHEET 6
BELOWRIE ROAD
Obley Road
PLAN
SCALE
TO DUBBO
EXISTING CURVE RADIUS
R350
R460
R200
R800
CUMBOOGLE ROAD
BELMONT ROAD
OBLEY CUMBOOGLE & BELMONT ROAD INTERSECTION SEE INTERSECTION 4 DETAIL - SHEET 6
PROPOSED ALIGNMENT IMPROVEMENT CORRIDOR
PROPOSED CURVE RADIUS
EXISTING ALIGNMENT
PLAN
SCALE
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
EXISTING CONDITIONS & INTERSECTION PLAN CH 3900 - CH 7800
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-5
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au


R400
4750
4800
4850
4900
INTERSECTION 3
OBLEY ROAD &
BELOWRIE ROAD
PROPOSED TREATMENT
TO DUBBO
OBLEY ROAD
PLAN
SCALE
1 : 250
BELOWRIE ROAD
INTERSECTION 4
OBLEY ROAD, BELMONT
& CUMBOOGLE ROAD
PROPOSED TREATMENT
CUMBOOGLE ROAD
6650
6550
6600
6700
TO DUBBO
OBLEY ROAD
BUS STOP
BUS SHELTER
PLAN
SCALE
1 : 250
BELMONT ROAD
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
INTERSECTIONS 3 & 4
PROPOSED TREATMENTS
DETAIL SHEET
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION
& INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Plan Size: A1
Drawing No: 201205-6


INTERSECTION 5
OBLEY ROAD &
BENOLONG ROAD
EXISTING TREATMENT
INTERSECTION 5
BENOLONG ROAD
SEE DETAIL BELOW
EXISTING CURVE RADIUS
PROPOSED CURVE RADIUS
EXISTING ALIGNMENT
PROPOSED ALIGNMENT
IMPROVEMENT CORRIDOR
TO DUBBO
BENOLONG ROAD
OBLEY ROAD
R500
R450
R460
R300
TP8159
TP8369
TP8887
TP8898
TP9439
TP9440
TP9830
TP9841
TP9857
TP9858
PLAN
SCALE
1 : 2500
EXISTING CONDITIONS & INTERSECTION 5
PLAN CH 7800 - CH 10250
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
Client:
DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION
& INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-7
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au



REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.
B	11-12-2012	DB	ISSUED FOR REVIEW	MB
A	04-09-2012	DB	ISSUED FOR REVIEW	--

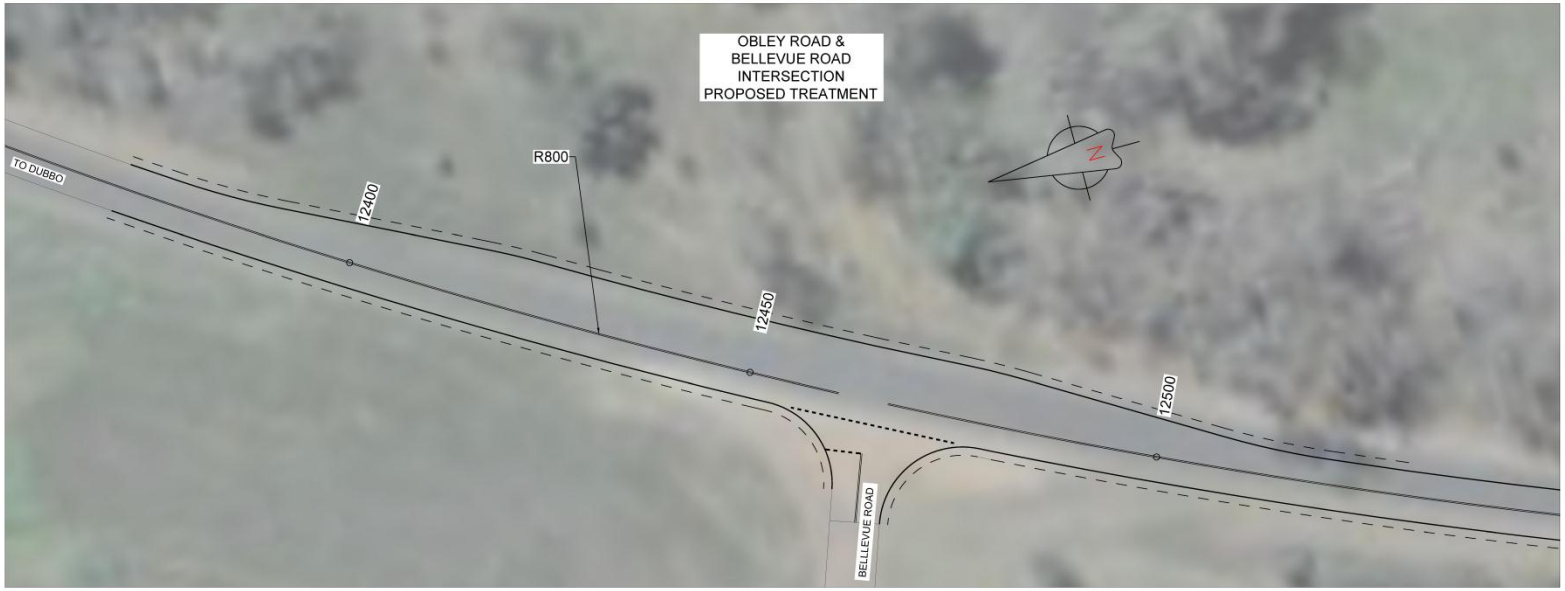
EXISTING CONDITIONS & INTERSECTION PLAN - CH 10000 - CH16000

Client: **DUBBO ZIRCONIA PROJECT**

OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT

Design Completed: 10-12-2012 | Designed: DB | Status: PRELIMINARY | Plan Size: A1 | Drawing No: 201205-8

CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au



REVISIONS					
REV.	DATE	BY	DESCRIPTION	CHK.
B	11-12-2012	DB	ISSUED FOR REVIEW	MB
A	04-09-2012	DB	ISSUED FOR REVIEW	--

INTERSECTION 6
PROPOSED TREATMENT
DETAIL SHEET

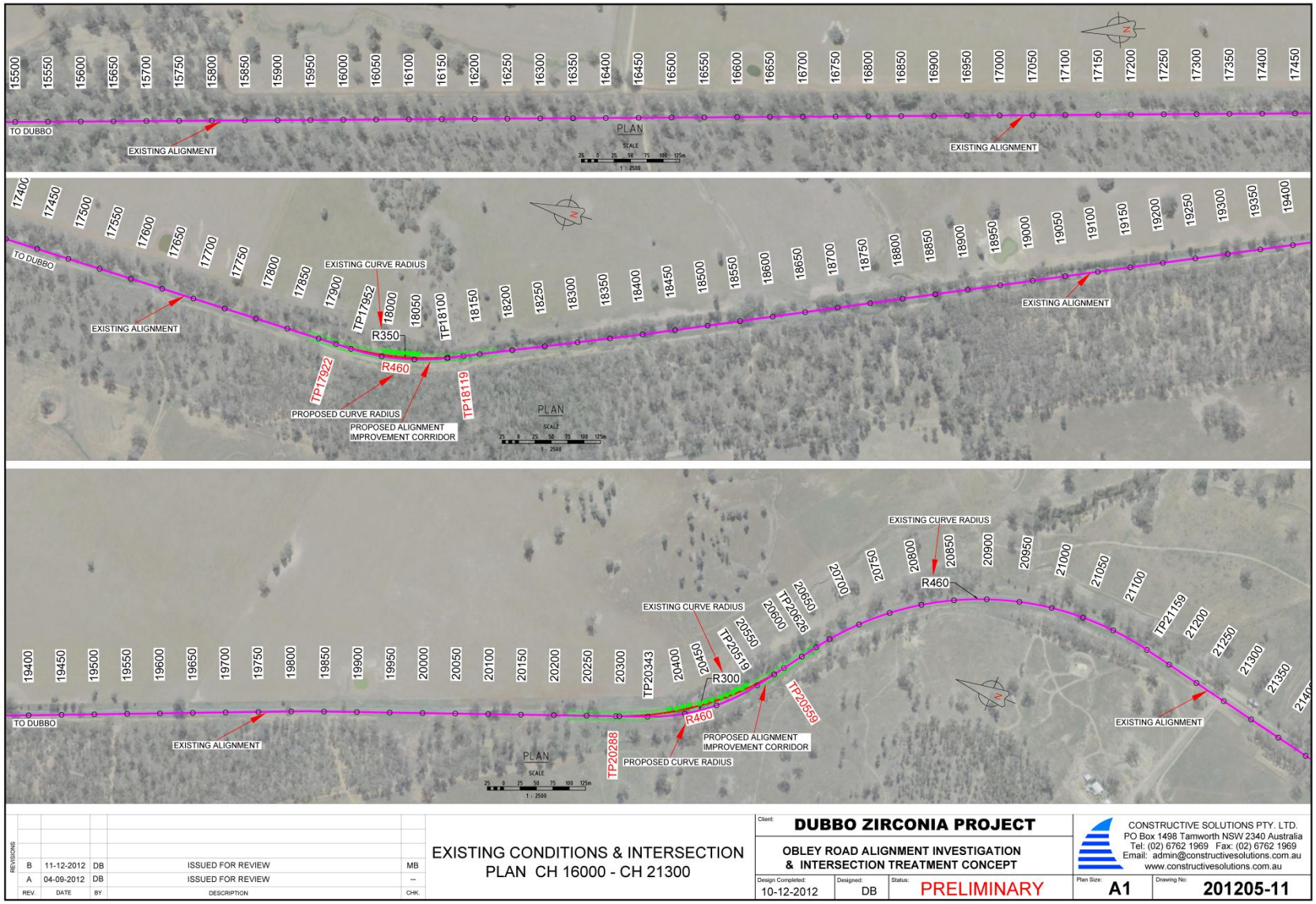
Client: **DUBBO ZIRCONIA PROJECT**

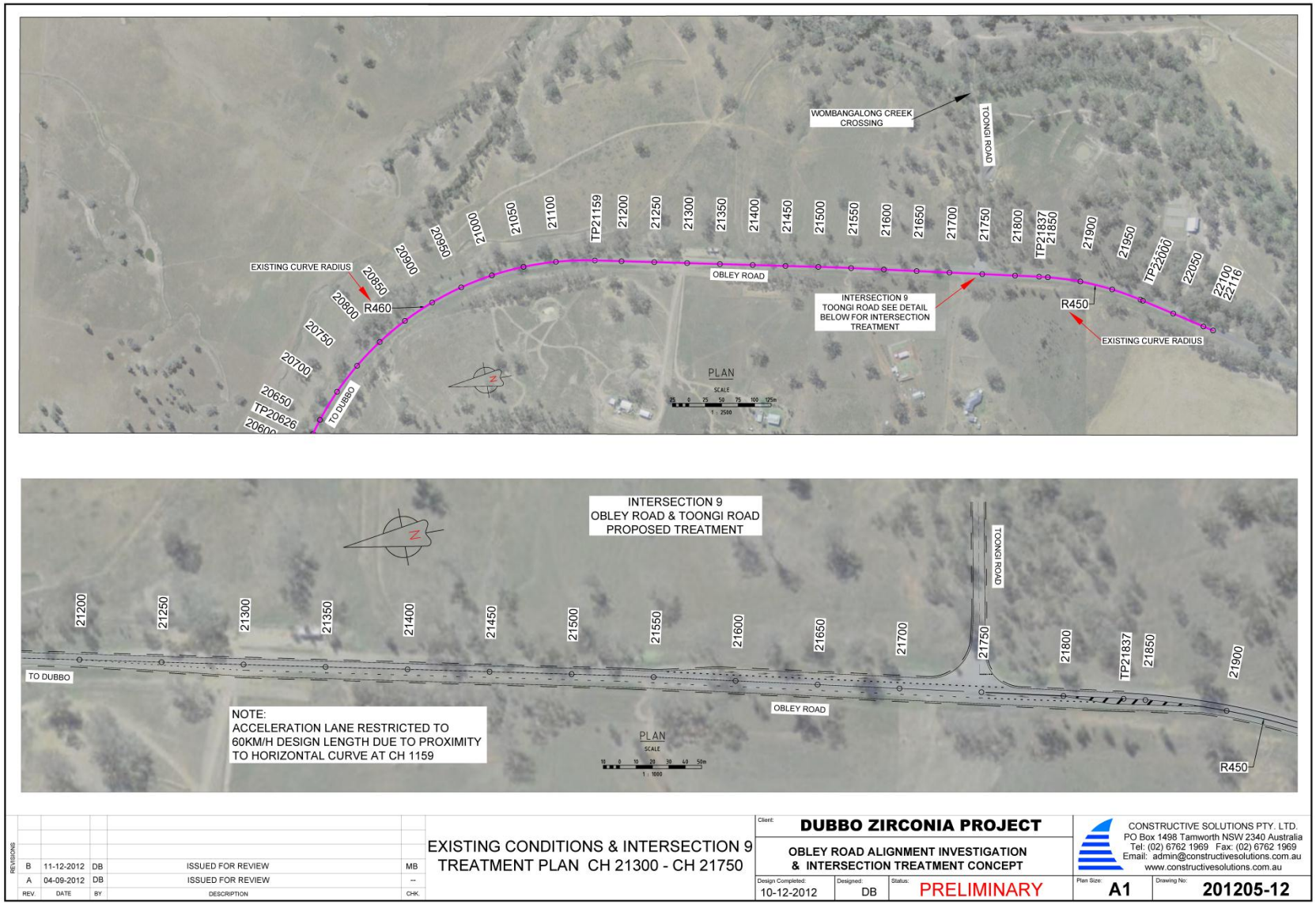
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT

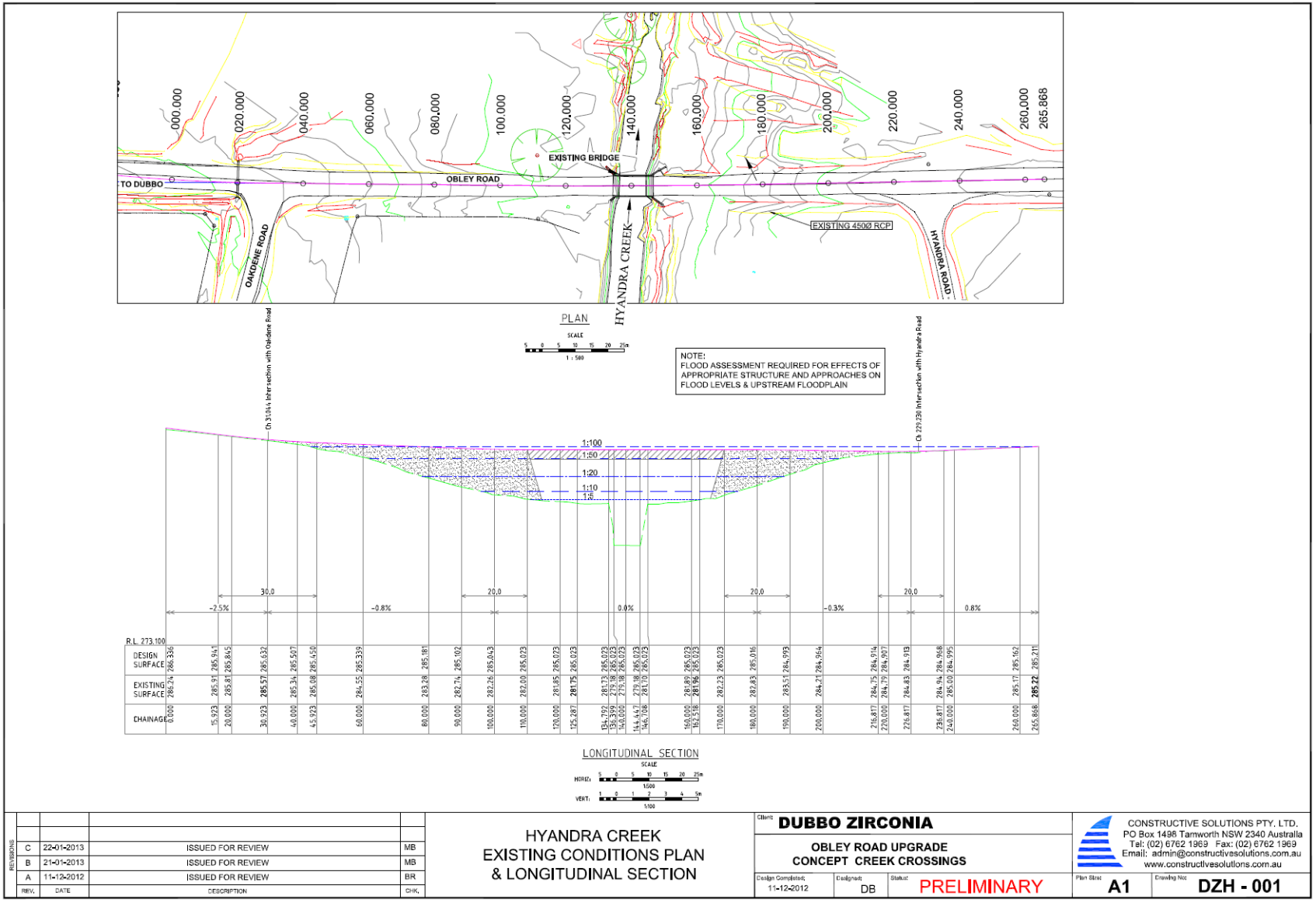
Design Completed:	Designed:	Status:	Plan Size:	Drawing No:
10-12-2012	DB	PRELIMINARY	A1	201205-9

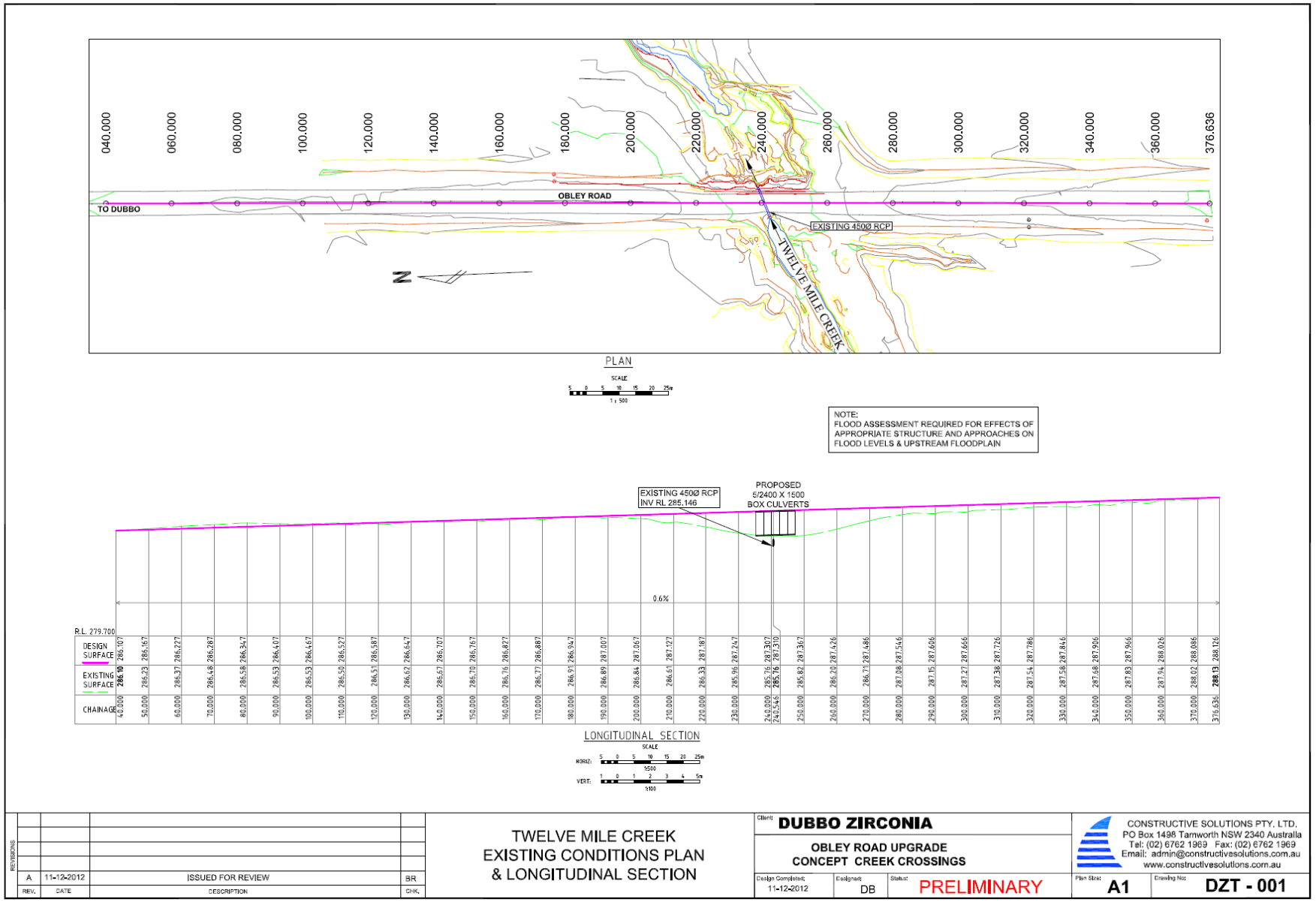
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au

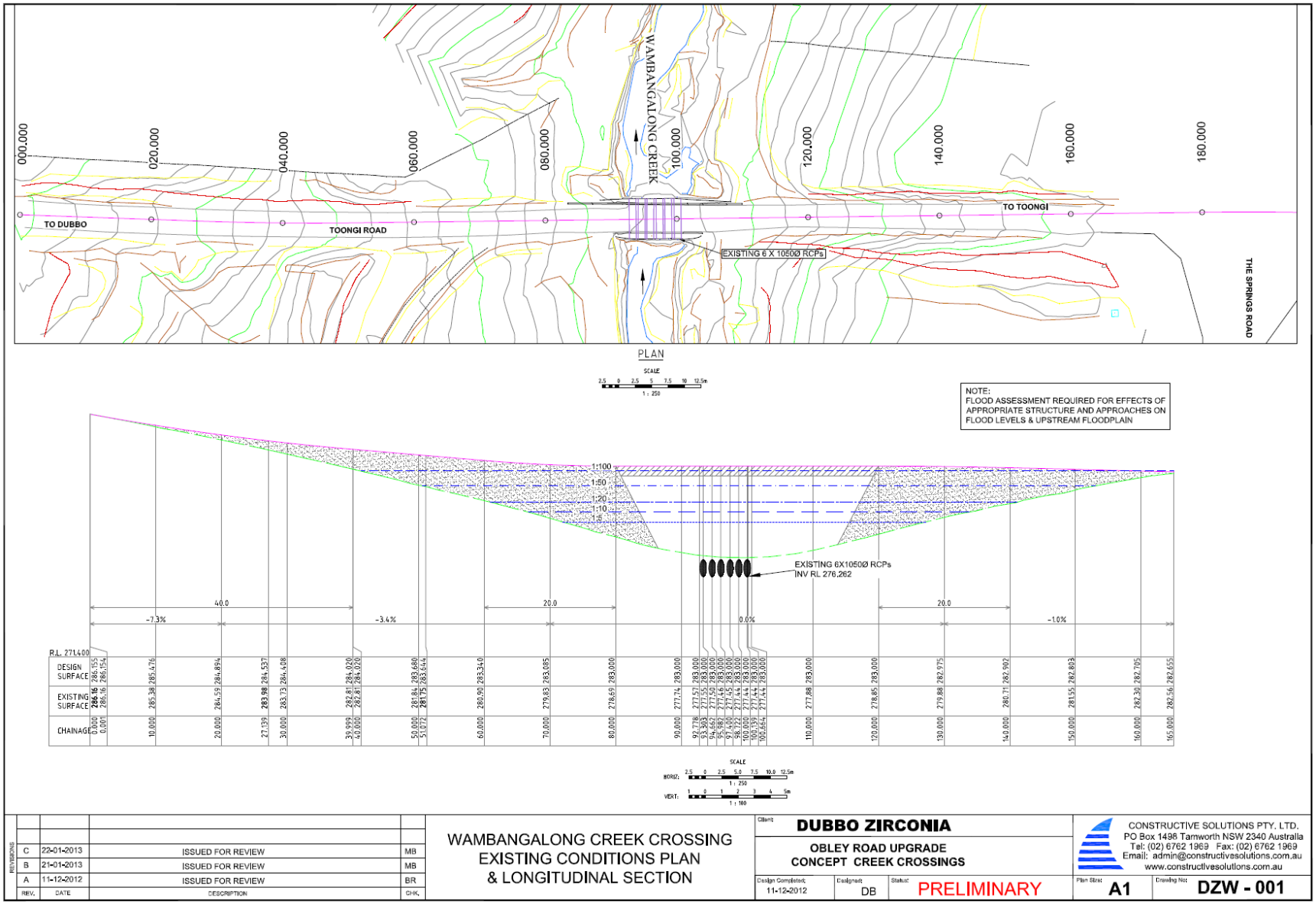

INTERSECTION 7
OBLEY ROAD & OAKDENE ROAD
PROPOSED TREATMENT
14900
14950
15000
15050
BRIDGE
TO DUBBO
NOTE:
INTERSECTION WIDENING AT OAKDENE ROAD
RESTRICTED TO 60KM/H DESIGN SPEED DUE
TO PROXIMITY TO HYANDRA CREEK BRIDGE
OAKDENE ROAD
PLAN
SCALE
1 : 250
INTERSECTION 8
OBLEY ROAD & HYANDRA ROAD
PROPOSED TREATMENT
15100
15150
15200
15250
BRIDGE
TO DUBBO
NOTE:
INTERSECTION WIDENING AT HYANDRA ROAD
RESTRICTED TO 60KM/H DESIGN SPEED DUE
TO PROXIMITY TO HYANDRA CREEK BRIDGE
HYANDRA CREEK
HYANDRA ROAD
PLAN
SCALE
1 : 250
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
INTERSECTIONS 7 & 8
PROPOSED TREATMENTS
DETAIL SHEET
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION
& INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-10
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au


TO DUBBO
EXISTING ALIGNMENT
PLAN
EXISTING ALIGNMENT
EXISTING CURVE RADIUS
R350
TP17952
TP18100
R460
TP17922
TP18119
PROPOSED CURVE RADIUS
PROPOSED ALIGNMENT IMPROVEMENT CORRIDOR
EXISTING ALIGNMENT
EXISTING CURVE RADIUS
R460
EXISTING CURVE RADIUS
R300
TP20343
TP20519
TP20626
R460
TP20559
TP20288
PROPOSED CURVE RADIUS
PROPOSED ALIGNMENT IMPROVEMENT CORRIDOR
TP21159
EXISTING ALIGNMENT
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
EXISTING CONDITIONS & INTERSECTION PLAN CH 16000 - CH 21300
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Plan Size: A1
Drawing No: 201205-11


WOMBANGALONG CREEK CROSSING
TOONGI ROAD
EXISTING CURVE RADIUS
R460
OBLEY ROAD
INTERSECTION 9
TOONGI ROAD SEE DETAIL BELOW FOR INTERSECTION TREATMENT
R450
EXISTING CURVE RADIUS
TO DUBBO
PLAN
SCALE
1 : 2500
INTERSECTION 9
OBLEY ROAD & TOONGI ROAD
PROPOSED TREATMENT
TO DUBBO
OBLEY ROAD
NOTE:
ACCELERATION LANE RESTRICTED TO
60KM/H DESIGN LENGTH DUE TO PROXIMITY
TO HORIZONTAL CURVE AT CH 1159
PLAN
SCALE
1 : 1000
R450
REVISIONS
B 11-12-2012 DB ISSUED FOR REVIEW MB
A 04-09-2012 DB ISSUED FOR REVIEW --
REV. DATE BY DESCRIPTION CHK.
EXISTING CONDITIONS & INTERSECTION 9 TREATMENT PLAN CH 21300 - CH 21750
Client: DUBBO ZIRCONIA PROJECT
OBLEY ROAD ALIGNMENT INVESTIGATION & INTERSECTION TREATMENT CONCEPT
Design Completed: 10-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: 201205-12
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au


000.000
020.000
040.000
060.000
080.000
100.000
120.000
140.000
160.000
180.000
200.000
220.000
240.000
260.000
265.868
EXISTING BRIDGE
TO DUBBO
OBLEY ROAD
OAKDENE ROAD
HYANDRA CREEK
EXISTING 450Ø RCP
HYANDRA ROAD
PLAN
SCALE
1 : 500
NOTE:
FLOOD ASSESSMENT REQUIRED FOR EFFECTS OF APPROPRIATE STRUCTURE AND APPROACHES ON FLOOD LEVELS & UPSTREAM FLOODPLAIN
Ch 31.514 Intersection with Oakdene Road
Ch 229.236 Intersection with Hyandra Road
1:100
1:50
1:20
1:10
1:5
30.0
20.0
20.0
20.0
20.0
-2.5%
-0.8%
0.0%
-0.3%
0.8%
R.L. 273.100
DESIGN SURFACE
EXISTING SURFACE
CHAINAGE
LONGITUDINAL SECTION
SCALE
HORIZ.
1:500
VERT.
1:100
REVISIONS
C 22-01-2013 ISSUED FOR REVIEW MB
B 21-01-2013 ISSUED FOR REVIEW MB
A 11-12-2012 ISSUED FOR REVIEW BR
REV. DATE DESCRIPTION CHK.
HYANDRA CREEK
EXISTING CONDITIONS PLAN
& LONGITUDINAL SECTION
Client: DUBBO ZIRCONIA
OBLEY ROAD UPGRADE
CONCEPT CREEK CROSSINGS
Design Completed: 11-12-2012
Designed: DB
Status: PRELIMINARY
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Plan Size: A1
Drawing No: DZH - 001


040.000
060.000
080.000
100.000
120.000
140.000
160.000
180.000
200.000
220.000
240.000
260.000
280.000
300.000
320.000
340.000
360.000
376.636
OBLEY ROAD
TO DUBBO
EXISTING 450Ø RCP
TWELVE MILE CREEK
N
PLAN
SCALE
1 : 500
NOTE:
FLOOD ASSESSMENT REQUIRED FOR EFFECTS OF APPROPRIATE STRUCTURE AND APPROACHES ON FLOOD LEVELS & UPSTREAM FLOODPLAIN
EXISTING 450Ø RCP
INV RL 285.146
PROPOSED
5/2400 X 1500
BOX CULVERTS
0.6%
R.L. 279.700
DESIGN SURFACE
EXISTING SURFACE
CHAINAGE
LONGITUDINAL SECTION
SCALE
HORIZ: 1:500
VERT: 1:100
REVISIONS
A
11-12-2012
ISSUED FOR REVIEW
BR
REV.
DATE
DESCRIPTION
CHK.
TWELVE MILE CREEK
EXISTING CONDITIONS PLAN
& LONGITUDINAL SECTION
Client:
DUBBO ZIRCONIA
OBLEY ROAD UPGRADE
CONCEPT CREEK CROSSINGS
Design Completed:
11-12-2012
Designed:
DB
Status:
PRELIMINARY
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Plan Size:
A1
Drawing No:
DZT - 001


000.000
020.000
040.000
060.000
080.000
WAMBANGALONG CREEK
100.000
120.000
140.000
160.000
180.000
TO DUBBO
TOONGI ROAD
TO TOONGI
EXISTING 6 X 1050Ø RCPs
THE SPRINGS ROAD
PLAN
SCALE
1 : 250
NOTE:
FLOOD ASSESSMENT REQUIRED FOR EFFECTS OF APPROPRIATE STRUCTURE AND APPROACHES ON FLOOD LEVELS & UPSTREAM FLOODPLAIN
1:100
1:50
1:20
1:10
1:5
EXISTING 6X1050Ø RCPs
INV RL 276.262
40.0
20.0
20.0
-7.3%
-3.4%
0.0%
-1.0%
R.L. 271.400
DESIGN SURFACE
EXISTING SURFACE
CHAINAGE
SCALE
HORIZ: 1 : 250
VERT: 1 : 100
WAMBANGALONG CREEK CROSSING
EXISTING CONDITIONS PLAN
& LONGITUDINAL SECTION
REVISIONS
C 22-01-2013 ISSUED FOR REVIEW MB
B 21-01-2013 ISSUED FOR REVIEW MB
A 11-12-2012 ISSUED FOR REVIEW BR
REV. DATE DESCRIPTION CHK.
Client: DUBBO ZIRCONIA
OBLEY ROAD UPGRADE
CONCEPT CREEK CROSSINGS
CONSTRUCTIVE SOLUTIONS PTY. LTD.
PO Box 1498 Tamworth NSW 2340 Australia
Tel: (02) 6762 1969 Fax: (02) 6762 1969
Email: admin@constructivesolutions.com.au
www.constructivesolutions.com.au
Design Completed: 11-12-2012
Designed: DB
Status: PRELIMINARY
Plan Size: A1
Drawing No: DZW - 001

This page has been intentionally left blank

APPENDIX 15: SOME OBSERVATIONS OF THE BENEFITS OF THINNING CYPRESS STANDS AND DISCUSSION OF MANAGEMENT OPTIONS FOR WESTERN FORESTS AND WOODLANDS (CAMERON 1999)

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

Actively Managing for Biodiversity

Some observations of the benefits of thinning cypress stands and discussion of management options for western forests and woodlands.

Phil Cameron, Western Plains Zoo. P.O. Box 831 Dubbo NSW 2830

1. SUMMARY

Changes in fire and grazing regimes since European settlement have substantially altered native vegetation on the Western Plains. For example, some dense stands of cypress now exist where open eucalypt and cypress ecosystems formerly occurred. These dense stands suppress groundcover and understorey vegetation, and precipitate the death of older remnant trees. Other flora and fauna that rely on these habitat elements are consequently reduced. The establishment of dense stands of cypress pine and other 'woody weeds' is one amongst many land degradation problems on the western plains.

For more than a century, dense stands have been thinned to promote their grazing and timber values. The increased forage in thinned stands includes a diversity of native plants, but enhanced biodiversity has only recently been recognised as an additional benefit of thinning. Management of natural regrowth is now being recognised as a very cost effective way of rehabilitating previously cleared areas and enhancing biodiversity values. Thinning and feral animal control has been used to enhance the biodiversity of a wildlife sanctuary at Western Plains Zoo. This paper summarises observations of increased biodiversity within the sanctuary as a result of thinning and discusses potential management options to enhance biodiversity and socioeconomic values more widely in the regrowth forests of the western plains.

2. INTRODUCTION

Eucalypt and cypress woodlands and open forests were maintained in an open condition by natural fires, Aboriginal burning and grazing by native animals (AUSLIG 1990, Lunt 1997, Rolls 1981). European settlement had profound impacts on the ecosystems of the Western Plains. Within 50 years of settlement, the development of 'pine scrubs' was recognised as a major land management problem (Anon. 1988). Suppression of natural fires, cessation of Aboriginal burning and destocking during droughts removed the controls that had limited cypress establishment.

Cypress trees are very tolerant of competition. They are able to survive as small spindly trees for many decades, even over a century. The trees attain a low height and small diameter, after which they achieve negligible additional growth. This is called 'lock up'. Locked up stands contain little groundcover or understorey vegetation. Scattered larger remnant trees that have been engulfed by dense regrowth are liable to die during droughts. The locked up stands use all the site resources such as water, nutrients, light and space to stay alive. There are no resources to spare for other plants and their dependent animals. Dense 'wheatfield' regeneration established in the late nineteenth century, and again after rabbit plagues were controlled following the introduction of myxomatosis in the 1950's.

Development of pine scrub has long been recognised as a land management problem and thinning has as long been recognised as a solution. The first Annual Report of the New South Wales Forest Branch, in 1883, referred to "the alarming spread of pine scrub" (Anon. 1988). In 1884 nearly 4000ha of Forest Reserves in the County of Urana were thinned (Anon. 1998). Lessees did the thinning to improve herbage production for grazing and to facilitate rabbit control. The Forest Branch supervised the thinning to enhance timber production by the retained trees. This work enhanced timber values by allowing the retained trees to develop into sizes suitable for timber. The increased growth of herbage and the increased size of the cypress trees also represented an increase in biodiversity, both directly through an increased variety of plants, and indirectly through an increased variety of habitats. The grazing and timber production benefits of thinning were well recognised (e.g. Lacey 1973, Anon. 1986, Anon. 1988, Knott 1995), whereas the conservation benefits were largely overlooked until recent times when society has increasingly valued environmental as distinct from economic benefits.

As dense regrowth stands develop and lock up, biodiversity declines. Dense stands of pine regeneration lack structural and floral diversity and are likely to have limited faunal habitat value compared to more open and diverse ecosystems. The ability of dense cypress stands to virtually eliminate understorey and ground vegetation was recognised and used by western landholders for fire protection. Many holdings still have strips of dense cypress retained around their boundaries to serve as fire breaks. Grass fires usually stop when they reach dense cypress stands because there is no ground fuel to carry the fire (Lacey 1973). These dense 'monocultures' represent minimal biodiversity.

According to Reid (1999), trends toward local extinctions, reduced avian diversity and increased homogenization of regional landscapes appear to be accelerating despite the fact that in most regions land clearance has effectively halted. Ecologically, the 20 birds identified by Reid (1999) (see Appendix 7) as 'decliners' in the NSW sheep wheat belt were mainly ground and or low-shrub feeders and dwellers with only three canopy foragers and two aerial insectivores. Thinning of cypress is likely to promote suitable habitat for all these declining species.

In the 1990s, thinning was used in a wildlife sanctuary at Western Plains Zoo to enhance the biodiversity and habitat values of regrowth cypress and eucalypt forest. The sanctuary is free from domestic stock and exotic predators. This paper

summarises observations of the responses by native flora and fauna to the thinning program and discusses potential management options more generally for the regrowth forests of the Western Plains.

3. STUDY AREA

The 150 hectare Native Fauna and Flora Sanctuary is a portion of the 976 hectare Western Plains Zoo, situated 3 km south west of the city of Dubbo on the Western Plains of New South Wales. The Zoo, which includes the sanctuary, is triangular in shape, undulating to hilly, ranging in altitude from 260m on the river flats to 340m above sea level (Appendix 1). Annual rainfall averages 587mm (Bureau of Meteorology 2000). Underlying geology is rhyolite. Soils range from a shallow lithosol on a steep northerly slope to deep loams in drainage depressions and gullies. The site mostly occupies hills and gullies in the headwaters of a drainage system that runs in a generally easterly direction to the floodplain of the Macquarie River on the zoo's eastern boundary. Dense regrowth forest of white cypress (*Callitris glaucophylla*) including sporadic clumps and stands of black cypress (*C. endlicheri*) is the most extensive vegetation type, occupying 88 ha of the site. Various eucalypts including mugga ironbark (*Eucalyptus sideroxylon*) tumbledown red gum *(E.dealbata)* and Blakely's red gum (*E. blakelyi)* are scattered amongst the cypress. Cleared grassland with scattered trees and regrowth stands of trees and shrubs including whitebox (*E. albens*) greybox (*E. microcarpa)*, river red gum (*E. camaldulensis)*, Deans wattle, box-leafed wattle, western golden wattle (*Acacia deanei, A.buxifolia, A. decora)* and white cypress occupy the remainder of the site. The land shows evidence of significant cultural and archaeological relics and this is supported by oral history.

The northern quarter of the study site was a largely undeveloped section of an Army Base during World War II. Soldiers have described the site, during the war era, as having very few mature trees with a few scattered ironbarks on the hill country (Prentace 2002). A 1941 Army survey map shows only 3 clumps of pine in stands ranging from one to three hectares. In 1953 this part of the site, comprising about 40 ha was acquired by the Dubbo National Arboretum Society and fenced by the Forestry Commission. A census of plant species endemic to the arboretum site was conducted in April 1954. Over the next 5 years various plantings of Australian flora were undertaken. In 1972 the Minister for Lands inspected the site as a prospective location for an open range zoo. The site was described as a "former army camp (that) was eroded and included the Dubbo rubbish tip and a neglected arboretum" (Benton 2002). The arboretum society was disbanded in 1978.

The majority of the site was private land that had been used for dairy farming, mixed cropping and orcharding before being allowed to revert to grazing land. The shallower soiled hills and slopes carried dense regrowth forest stands dating from about the 1950s when myxomatosis reduced rabbit grazing pressure and allowed cypress seedlings to establish prolifically. The deeper soiled slopes and drainage lines carried scattered remnant trees and pastures. Four small dams existed in this part of the site. One was enlarged and landscaped for water birds after the property was acquired by

the Zoo in the early eighties. Trees and shrubs started to regenerate after exotic domestic grazing stock was removed when this section was fenced with a feral predator exclusion fence in 1992. Native and reintroduced macropods, as well as rabbits and hares now graze the site.

Native fauna reintroduced to the sanctuary since 1992 include quokka (*Setonix brachyurus*), parma wallaby (*Macropus parma*), bridled nailtail wallaby (*Onychogalea fraenata*), southern hairy-nosed wombat (*Lasiorhinus latifrons*), brushtailed bettongs (*Bettongia penicillata ogilby*), koala (*Phascolarctus cinereus cinereus*), rufous hare-wallaby or mala (*Lagorchestes hirsutus*) and mallee fowl (*Leipoa ocellata*). The twelve bridled nailtail wallabies that were released have increased to about 45 and twelve brushtailed bettongs have increased to about 100. There are seven mallee fowl aviaries within the sanctuary, each containing two or three breeding pairs of birds.

4. TREATMENTS

The WPZ property consists of five broad habitat types (Appendix 2). Parts of the dense regrowth forest on the site were thinned on three occasions between 1994 and 1999 (Appendix 3). Thinning was done by workers engaged in unemployment relief and training schemes, using brushcutters and chainsaws. Specifications were based on advice from State Forests (Nicholson 1997). They included retaining all trees predating the 1950s and all trees of species other than cypress. Cypress trees younger than the 1950s age class were to be thinned to a spacing of about 8m. Trees of good form and vigour were to be selected for retention but a range of age / size classes from the post 1950s regeneration was to be retained. Approximate areas of regrowth forest treated by year of thinning are shown in Table 1. Note that 15 ha of the study site, including all the 1999 thinning treatment, are outside of the sanctuary but within the zoo grounds. The seven malleefowl aviaries are all located in the unthinned control area inside the sanctuary.

Table 1

Year	*1994*	*1996/7*	*1999*	*Unthinned*	*Open grassland and woodland*
Area (ha)	40	13	15	20	77

5. METHODS

The thinnings were carried out to enhance the value of the sanctuary for wildlife conservation. They were not designed as a scientific experiment. The results of thinning have been monitored to guide future management. Informal observations by skilled staff have been made of vegetation and bird communities in the sanctuary area prior to thinning and periodically since thinning commenced.

In 1999, vegetation measurements were made in eight plots that were subjectively selected to represent the various thinning years and unthinned forests. They were circular plots of 0.1 ha. Percentage of ground area occupied by tree canopy, understorey and groundcover, debris and bare soil was estimated. Some understorey species were listed and counts were made of trees. A photograph was taken at each plot and other features were noted. In 2002, 0.04 ha square plots were centred on the same point as the circular plots in 1999. All plant species were identified and a cover abundance estimate was made of each species. Species richness and understorey cover were compared between thinned and unthinned plots and between thinning years. The number of species recorded in plots within the old arboretum site was compared with the number of species listed for the arboretum in 1954.

Plots were allocated amongst treatments as follows (See appendix 3).

Table 2

Thinning Year	1994	1996/7	1999	Unthinned
Plot No.	2,4,6	5,7	8	1,3

Plots 1 to 7 were located on gently sloping easterly and southerly aspects. Plot 8 (1999 Thinning) was on a steeper and rockier north-easterly aspect. Plot 8 and all the 1999 thinning was outside the fenced sanctuary and within the zoo's general grounds.

During May – June 2002, surveys were conducted of birds, reptiles and small ground mammals within each treatment area. Separate surveys were conducted of each component of the fauna and were repeated three times. Additionally, the three bird surveys were repeated by an independent observer.

The bird surveys recorded all birds seen or heard in the respective treatment areas. Reptile surveys were conducted haphazardly within each treatment area, by upturning rocks or examining other suitable habitat elements. Similar amounts of time were allocated to surveying birds or reptiles within each treatment area on each occasion. Small mammal surveys used 100 Elliot traps laid in straight line transects across the treatment sites with traps evenly spaced at 10 m. The 100 traps were evenly distributed amongst the treatment areas Peanut butter and muesli / dried fruit mix was used as bait. The traps were deployed across each treatment site for three consecutive nights. Spotlighting surveys were conducted by vehicle and on foot for nocturnal / arboreal mammals within each of the treatment areas. Three surveys were conducted per treatment site.

Radiotracking observations were made of habitat use by a sugar glider native to the site in 2002 and by other reintroduced native fauna during various periods between 1997 and 2002. Observations were made of animals' use of habitat including thinned forest, unthinned forest, woodland and grassland for forage, shelter and nesting.

6. RESULTS

6.1 VEGETATION

Thinning immediately increased the amount of light and of woody debris on the ground. Following thinning there appeared to be a gradual increase in the amount of groundcover and understorey vegetation in the thinned areas. Groundcover did not always respond immediately to thinning but usually did so in the first favourable season after thinning. Development of eucalypt regeneration was observed in thinned areas but not in unthinned areas. Dieback of eucalypt crowns and death of mature eucalypt and cypress trees had occurred in dense pine stands prior to thinning. Further dieback and mortality has not been observed in thinned stands but appears to be continuing in unthinned stands.

Three years after thinning, there was still only 1% groundcover vegetation in plot 5 (1996/7 thinning). This slow development of groundcover appeared to be associated with heavy browsing by rabbits and wallabies. Understorey data for 1999 are summarised in Table 3.

Table 3

THINNING YEAR	***UNTHINNED***	***1999***	***1996/7***	***1994***
% bare ground	99	98	30	30
% understorey cover	<1	2	31	67
No. of understorey species	2	5	5	12

The vegetation survey conducted in 2002 was during a very cold and unusually dry winter. A large number of wallabies were browsing in the sanctuary and appeared to have a severe effect on the understorey vegetation during this period. The 1999 thinning site (outside the sanctuary) was not as severely browsed as the other treatments. Understorey data for 2002 are summarised in Table 4.

Table 4

Thinning year	unthinned	1999	1996/7	1994
% bare ground	99	60	70	60
% understorey cover	<1	2	20	40
No. of understorey species	***33***	***28***	***38***	***47***
Average no. Species per plot	***22***	***28***	***25***	***24***

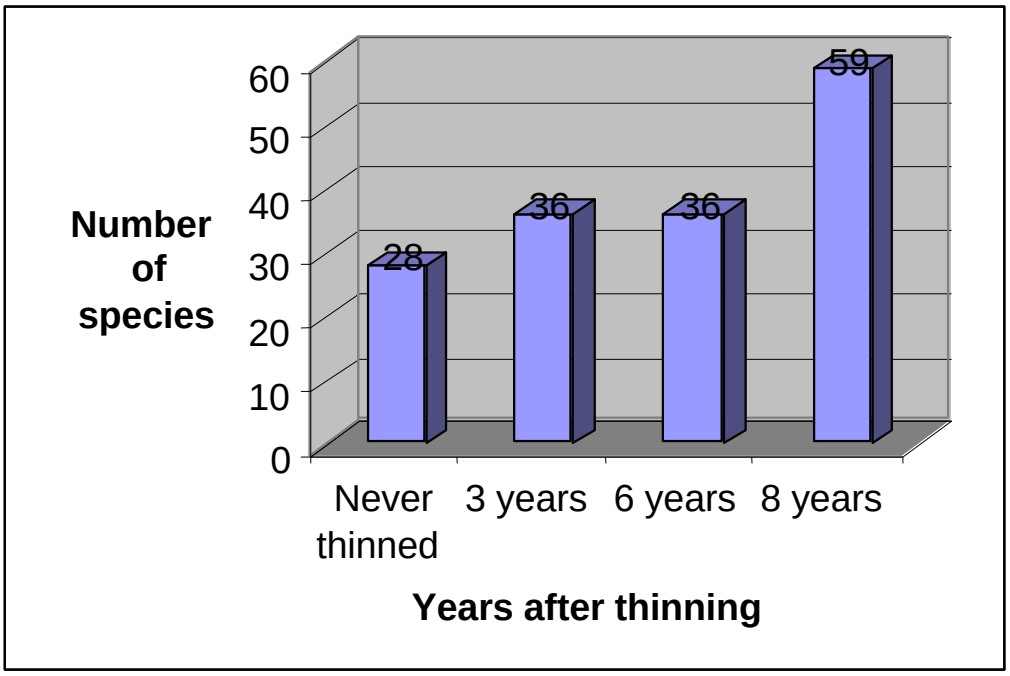
Regenerating pine seedlings were recorded within all of the treatments, but were least common in the unthinned controls. The 1999 thinning site had the highest numbers of pine seedlings, mainly associated with the fallen timber. Seedlings at the other thinned sites were mostly cropped at a height of about 1cm above the ground. Heavy browsing was evident.

There were 65 plant species recorded at the arboretum site (about 60ha) in 1954. The 1954 list did not include grasses, forbs and orchids. In 2002, there were 45 species, excluding orchids, grasses and forbs, and 59 species altogether recorded in the 5 plots (0.2ha) within the arboretum site. The largest number of species (28) in a single plot was found outside the wildlife sanctuary in the 1999 thinning area.

6.2 AVIFAUNA

Informal observations indicated that avian diversity had increased after thinning. There appeared to be an edge effect, where birds were utilizing the edges of dense pine stands but making little use of central areas. In 2002, avian diversity was lowest in the unthinned area and increased with age of thinning (Figure 1). Species counts per treatment are total counts from 6 surveys. In addition to the species richness, the abundance of birds appeared to be greater in the thinned areas.

Figure 1: Avifauna species richness in unthinned and thinned cypress pine stands at Western Plains Zoo 2002.

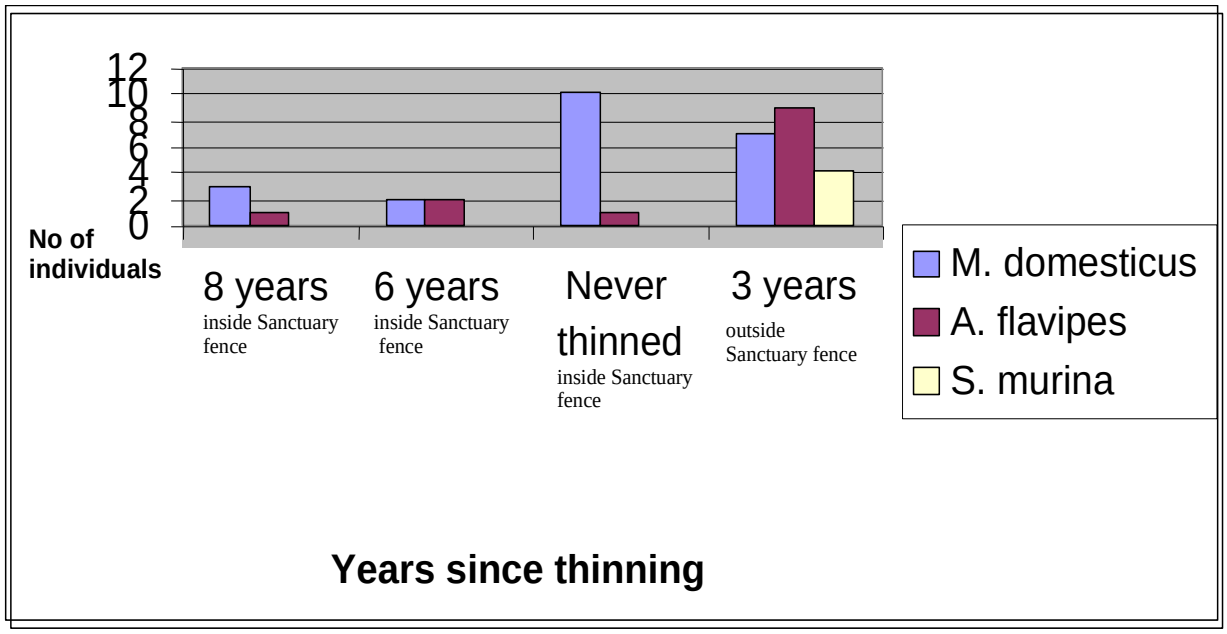


Six threatened species, the barking owl (*Ninox connivens*), swift parrot (*Lathamus discolor*), grey-crowned babbler (*Pomatostomus temporalis*), diamond firetail finch (*Stagonopleura guttata*), brown tree-creeper (*Climacteris picumnus)* and speckled warbler (*Pyrrholaemus saggitata*) were recorded during the surveys. Nests of grey-crowned babblers (*P. temporalis*), and diamond firetail finches (*S. guttata*) were observed in thinned areas adjacent to native grass pastures but not in unthinned areas. A barking owl (*Ninox connivens*) was observed during the spotlighting surveys in the 1994 thinning area. Barn owls (*Tyto alba*), tawny frogmouths (*Podargus strigoides*), Australian owlet-nightjars (*Aegotheles cristatus*) and boobook owls were recorded in other surveys. Only the boobooks were observed in unthinned cypress.

6.3 SMALL GROUND MAMMALS

Two native marsupials and one exotic rodent (house mouse) were trapped. In the sanctuary, most of the Elliot traps that were sprung, failed to trap animals. There were no apparent differences between treatments, within the boundaries of the Sanctuary, in the prevalence of sprung traps. They were probably sprung by brushtailed bettongs, which are too large to be caught in the traps. The largest numbers of small mammals were caught outside the sanctuary in the 1999 thinning treatment. This was the only area where *Sminthopsis* were caught. Within the sanctuary, relatively large numbers of house mouse were caught in the unthinned area and smaller numbers in thinned areas. Small numbers of *Antechinus* were caught in all areas.

Figure 2: Small mammal abundance in unthinned and thinned cypress pine stands at Western Plains Zoo 2002.



6.4 ARBOREAL MAMMALS

Sugar gliders (*Petaurus breviceps*) and common brushtailed possums (*Trichosurus vulpecula*) were observed in the 1994 thinning area, usually foraging amongst scattered wattle primarily in the vicinity of mature eucalypts and in areas of regenerated eucalypt. Radiotracking observations of a female sugar glider in the sanctuary indicated that it nested in hollow dead branches of red gum (*E. dealbata* and *E. blakelyi)* trees. It foraged in the open woodland and the thinned pine stands. The glider sheltered in the thinned pine when disturbed but it apparently did not use unthinned pine stands. The glider was also never observed in a dense stand of Deans' wattle (*A.deanii*) occurring 25 meters from its nesting site.

6.5 REPTILES

The weather was very cold (0 – 13 ºC) and drought conditions prevailed during the survey period. Nine animals from seven different species were recorded: eastern spiny-tailed gecko (*Diplodactylus intermedius*), ocellated velvet gecko (*Oedura monilis*), striped skink (*Ctenotus robustus*), Boulenger's skink (*Morethia boulengeri*), shingleback lizard (*Trachydosaurus rugosus*) and yellow-faced whip snake (*Demansia psammophis*). Four of the seven species (6 animals) occurred in the 1994 thinning area and one animal of one species was observed in each of the other treatments.

6.6 BEHAVIOUR OF REINTRODUCED NATIVE ANIMALS

Bridled nailtail wallabies were never observed in unthinned pine. Brushtailed bettongs and koalas' were sometimes observed in unthinned pine. Koalas were usually associated with mugga ironbark (*Eucalyptus sideroxylon*) or red gums. Cypress were

often used for shelter during very hot weather. There was no apparent preference for cypress in either thinned or unthinned stands, but koalas sheltered in larger cypress trees. A radiocollared male maleefowl was most often observed in the unthinned stands around the maleefowl aviaries. It was frequently seen running along aviary fences in tandem with males inside the fences. The malleefowl was observed foraging only in the oldest thinning treatment.

7. DISCUSSION

7.1 VEGETATION AND MICROHABITAT

Thinning immediately contributed to diversity of microhabitat by increasing sunlight and woody debris on the ground in thinned areas. The understorey data were apparently confounded by variations in grazing pressure by both pests and wallabies within the sanctuary and between the sanctuary and the general zoo area. Nevertheless, percentage of vegetative groundcover was lowest in unthinned areas and increased with age since thinning. Wells (1974) showed that thinned cypress stands contained 7 times more herbage than unthinned stands after 3 years without grazing. There were no clear differences in the number of plant species between the different treatments, however the largest number of species was observed in the 1999 thinning treatment outside the sanctuary. This may reflect lower grazing pressure on this site, or environmental differences. Heavy grazing within the sanctuary may have masked the presence of more palatable species.

No developing eucalypt regeneration was observed in unthinned areas, whereas some vigorous seedlings and saplings were observed in thinned areas. Similar observations have been made in timber production forests that have been non commercially thinned (either manually or mechanically) or burnt by fire. The cypress regeneration is usually killed, whilst the lignotuberous eucalypt regeneration resprouts and develops rapidly (pers obs VJ). There appeared to be no signs of recent dieback or death of mature trees in thinned areas, despite the recent drought, whereas dieback and mortality appears to be continuing in unthinned stands. All hollow bearing trees that have been investigated in the sanctuary were used by mammals (pers obs PC), indicating that populations of arboreal animals and hollow dependent birds may be limited by supply of hollows. Survival and recruitment of hollow bearing trees, and therefore populations of hollow dependent fauna, are likely to be promoted by thinning in dense cypress stands.

The plant species list recorded in 1954 comprised all species identified in the 60ha arboretum site, but included few herbs and grasses. This list is not directly comparable with the plot data from 2002, which represent a total area of much less than a hectare and include many herbs and grasses. It may be that a lower diversity of species occurs in the area than was the case prior to the development of dense cypress regeneration or the lower species richness may reflect the much smaller area sampled. Populations of plants are much smaller in unthinned areas and the tree and shrub species remain as small stunted individuals in the dense cypress stands. Thinning has increased the

quantity and diversity of habitat available to animals in the thinned areas. Total apparent plant diversity and differences between thinned and unthinned plots may be higher in future following reduction of grazing pressure in the sanctuary. This will be monitored.

7.2 AVIFAUNA

The species and numbers of birds observed in the sanctuary area appeared to increase gradually from the time of the earliest thinning operations. Most of the birds in the unthinned areas were observed at the outside edges of these dense stands. The surveys in 2002 recorded greater species richness in thinned than in unthinned stands. This may be partly due to the larger area (40ha) in the earliest thinning treatment compared to the unthinned stand (20ha), however we consider that it is unlikely to explain the large differences, particularly as there were more birds species in the small thinning areas (13ha, 15ha) and, in the unthinned stands, most of the bird species were at the fringes of the open areas.

Nineteen of the twenty species of birds identified by Reid (1999) as declining species within the NSW sheep wheat belt have been recorded on the study site. Only five of these species were recorded in the unthinned areas and the 1999 site. Four of the 'decliner' species were present at each of the study sites; the speckled warbler (*Chtonicola sagittata)*, red-capped robin *(Petroica goodenovii),* eastern yellow robin *(Eopsaltria australis)* and the rufous whistler (*Pachycephala rufiventris)*. The additional declining species found in the unthinned area was the varied sittella (*Daphoenositta chrysoptera)* and the additional species found in the 1999 thinning area was the white browed babbler (*Pomatostomus superciliosus).* Eight 'decliners' were found within the 1996/7 site and nine in the 1994 thinned areas. The rest of the declining species noted at the site were less than 30 meters outside of the treatment areas in the nearby open grass land, roadside or aquatic habitats. Most of the declining species (15) are insectivorous ground or shrub feeders and dwellers (Reid 1999). The microhabitat in the thinned plots, including the fallen timber, may support a more diverse invertebrate fauna, as well as a greater quantity of ground and shrub cover, providing resources for a more diverse avifauna.

Nests of the threatened species grey-crowned babbler, speckled warbler and diamond firetail finch as well as other declining species (Reid 1999) including the red capped robin, eastern yellow robin, and the varied sittella were observed in cypress trees in thinned stands but not in unthinned stands. Tree development and stand structures in the unthinned stands may be less suitable or unsuitable for nesting.

Although the radiocollared Maleefowl was most frequently observed in unthinned stands around the breeding aviaries, the bird was probably attracted by the other birds inside the aviaries. The bird was observed foraging only in the 1994 thinned area. The malleefowl in the aviaries are artificially fed. Although the malleefowl aviaries are within unthinned stands, the small enclosures have been heavily thinned and support the majority of vegetative diversity within this site.

7.3 SMALL GROUND MAMMALS

The common dunnart (*Sminthopsis murina*) is uncommon in the area and the yellow footed antechinus *(Antechinus flavipes)* is a species of regional significance. Although the trapping results were apparently confounded by the activities of bettongs in the sanctuary, it appears that unthinned sites may support higher numbers of the introduced house mouse whilst thinned sites may support more small native mammals. The abundance of yellow footed antechinus in the 1999 thinning treatment is encouraging.

7.4 REINTRODUCED SPECIES

The endangered bridled nailtail wallaby and brushtailed bettong both have become locally extinct in the Dubbo area. In the sanctuary, these species both appear to rely heavily on the thinned areas for shelter and protection from raptors even though they are distinct in other aspects of their natural histories (see appendix 4 and 5).

7.5 ARBOREAL ANIMALS

All of the arboreal animals seen were in the vicinity of old hollow bearing eucalypts. The sugar glider was never observed in dense stands of cypress trees. It is probable that gliders are unable to volplane in ‘wheatfield’ stands of cypress and that there is insufficient forage in these stands to encourage gliders into them. When disturbed, the glider sheltered in the tops of cypress trees, but never sought refuge in the dense unthinned stands (Appendix 6). Thinning appeared to have resulted in increased density of the pines’ apical foliage therefore providing more shelter for the sugar glider than would trees in unthinned stands.

7.6 REPTILES

There were similar amounts of loose rock on the ground at all sites except the 1999 thinning area which was very rocky. All the thinned sites carried similar amounts of woody debris, whereas the unthinned sites were very bare. The apparent, relatively high numbers and diversity of reptiles in the oldest thinning area may be a result of additional foraging resources associated with more weathered woody debris and more advanced groundcover development compared with the later thinning treatments, as well as the increased sunshine compared to the unthinned areas. The microhabitat created by the fallen pine apparently provided suitable ‘over wintering’ sites for reptiles. Additional reptile surveys are planned to be carried out in more suitable seasonal conditions.

7.7 BIODIVERSITY

Thinning immediately increased structural diversity. In the short term, populations of groundcover plants and shrubs increased, creating additional structural diversity. Evidence for increased plant species diversity was not clear and was possibly confounded by high grazing pressure within the sanctuary. In the long term, reduced attrition and increased recruitment of mature trees as a result of thinning will also enhance structural diversity and potential populations of hollow dependent fauna.

Increased structural diversity had immediate and short term impacts on biodiversity. Thinning increased the amount of habitat available to sugar gliders and nailtail wallabies as well apparently improving habitat value for bettongs. Thinning led to increases in avian diversity. It appeared that reptile populations and diversity may also have been enhanced in the short to medium term. There was evidence suggesting that thinning improved the habitat value for native small mammals and allowed them to compete more effectively with the house mouse.

8. MANAGEMENT IMPLICATIONS

Prior to European settlement, fires together with grazing by native fauna were the agents that maintained open conditions and biodiversity in the western woodlands and forests. In New South Wales, fire has generally not been used to manage these ecosystems since European settlement because of its potential negative impacts on forage and timber production. Grazing can be used to manage fuel loads for fire protection and to control unwanted tree regeneration (Anon. 1988 Wilson et al. 1997).

The benefits to grazing and timber production values (e.g. Lacey 1973, Anon. 1986, Anon. 1988, Knott 199X), of thinning dense cypress, are well documented. Although the economic benefits have long been recognised, the conservation benefits to biodiversity are only beginning to be recognised (e.g. Jurskis 2000). Oliver *et al* (2002) recognised that natural regrowth can be used as a cost-effective way of revegetating previously cleared landscapes and that enhanced biodiversity, in some circumstances, can be promoted by thinning. In western New South Wales, the controls that previously limited the density of regeneration establishment were removed following European settlement. To restore more natural landscapes and enhance biodiversity, active management of natural regrowth will be essential.

There is some potential to substitute low intensity fire, and/or carefully managed grazing, for thinning as a management tool to maintain conservation as well as economic values (Anon. 1988). This would only be possible at the early regeneration phase since dense regeneration will not sustain low intensity fire or grazing. The use of fire has been suggested for similar ecosystems in Queensland (Johnston and Jennings 1991) and apparently adopted to some extent (Peter Male pers. comm.). It should be considered for western cypress-eucalypt ecosystems in New South Wales as part of a new approach (Anon. 1988) that recognises changing management objectives and employs a wider range of management practices to achieve them. Various combinations of timber harvesting, thinning, grazing and burning, together with feral animal and pest plant control could be used to achieve multiple objectives of

conservation, timber production, recreation and so on. Any combination of management activities, having multiple objectives that include conservation, is likely to produce better biodiversity outcomes than passive management of dense cypress stands. This conclusion would logically extend to other dense regeneration stands of species such as bulloak.

The thinning trials in the sanctuary have created opportunities for the reintroduction of low intensity fire into the sanctuary environment. Some low intensity patch burning was carried out following the flora and fauna surveys reported here. The heavy grazing pressures and reduced vigour of wallabies observed during the surveys have recently been alleviated by pest control operations and culling of some common macropod species under NPWS licence. Monitoring of wildlife populations will continue.

The thinning operations at Western Plains Zoo have demonstrated tangible benefits to biodiversity within this small part of the Zoo (88 ha) over a short time frame. Some indication of the potential for landscape scale benefits of active management was given by the results of a biodiversity and constraints study carried out over 3 years to plan for future sustainable development. The study indicated that the entire zoo area of 976 ha contained more native biodiversity than is represented by the combined native and exotic animal exhibits (Cameron and Engle 2002). The thinning trials in the sanctuary have encouraged further development of active management systems to provide environmental, social and economic benefits in western forests and woodlands.

9. ACKNOWLEDGMENTS:

The author greatly appreciates the long term commitment of technical and other advice from State Forests of NSW, particularly from the Western Office. Vic Jurskis for editing and filtering out the waffle. Doug Binns for the flora surveys, Judy Peete, Dion Hobcroft, David Paull for the fauna surveys and to Nth Ltd for providing funding for Habitat Restoration Project WPZ.

References:

Anon (1986) Management Plan for Pilliga Management Area. Forestry Commission of N.S.W.

Anon (1988) Notes on the silviculture of major N.S.W. forest types. 10 Cypress pine types. Forestry Commission of N.S.W. Sydney

Australian Surveying and Land Information Group. (1990). *Atlas of Australian Resources, Third Series, Volume 6. Vegetation.* Department of Administrative Services, Canberra.

Benton, J.N., (2002) Aboriginal and European Heritage Survey: Western Plains Zoo, Dubbo NSW. July 2002. Consultancy Report.

Bureau of Meteorology (2000) *www.bom.gov.au*

Cameron, P.J., and Engle, D. (2001) 'Natural Resource Management: Its role on ecotourism enhancement and sustainability' *ARAZPA Conference Paper, Western Plains Zoo June 2001.*

Jurskis, V. (2000). Vegetation changes since European settlement of Australia: an attempt to clear up some burning issues. *Australian Forestry* **63** (3): 166–173.

Johnston, T.N. and Jennings, K.S. (1991) Management of cypress pine forests in Queensland. In *Forest Management in Australia* (eds F.H. McKinnell, E.R. Hopkins and J.E.D. Fox). Surrey Beatty & Sons in association with Institute of Foresters of Australia. Knott, J (1995) White cypress pine thinning trials of the Western Region. Research Paper No. 27. Research Division. State Forests of New South Wales. Sydney

Knott, J. (1995). White cypress pine thinning trials of the Western Region.

Research Paper No. 27. Research Division State Forests of New South Wales.

Sydney

Lacey, C.J. (1973) Silvicultural characteristics of white cypress pine. Research Note No. 26. Forestry Commission of N.S.W.

Lunt, I. D. 1997. Effects of long term vegetation management on remnant grassy forests and anthropogenic native grasslands in south-eastern Australia. Biological Conservation 81: 287-297.

Nicholson, D., (1997) 'Managing Cypress Pine on Your Property' State Forests of NSW Western Division and the N/W Catchment Management Committee.

Oliver, I., Eldridge, D., Wilson, B., (2002) Regrowth and Soil Erosion in Central West NSW – Report to the Native Vegetation Advisory Council (DLWC).

Prentace, A. (2002) Personal Communication.

Reid, J., (1999) Threatened and Declining Birds in the NSW Sheep Wheat Belt. Consultancy Report prepared for the NSW NPWS.

Rolls, E.C. (1981) A million wild acres: 200 years of man and Australian forest. Thomas Nelson. Melbourne

Wells, K.F. (1974) Pasture and forest: the situation in NW N.S.W. Proceedings of 7th IFA Conference, Caloundra, Queensland Institute of Foresters of Australia.

Wilson, A.D., Oxley, R.E. and Bratby, W.J. (1997) A grazing management strategy for Buckingbong State Forest. Department of Land & Water Conservation and State Forests of NSW

List of Appendices

Appendix One – Western Plains Zoo property map

Appendix Two – Five broad habitat types on the WPZ property. **Source** : Engle 2002.

Appendix Three - Thinning sites Western Plains Zoo

Appendix Four - Bridled nail-tail wallaby distribution ANFFS WPZ

Appendix Five – Brushtailed bettong distribution ANFFS WPZ

Appendix Six – Sugar glider distribution ANFFS WPZ

Appendix Seven – Declining Birds Species in the Sheep Wheat Belt
"the 20 decliners" defined by Reid (1999)

APPENDIX 16: CURRICULUM VITAE (PINK-TAILED WORM-LIZARD PLAN OF MANAGEMENT TEAM)*

Note*: This Appendix is only available on the Project CD

This page has been intentionally left blank

Curriculum Vitae: TEAM LEADER

Name: Dr. Arthur William White

Home Address: 69 Bestic Street, Rockdale, N.S.W. Australia 2216

Home Phone Number (and Fax No.): (02) 9599 -1161

Date of Birth: 22 . 2 . 1951

Marital Status: Married , two children.

Occupation: Director, Biosphere Environmental Consultants Pty. Ltd.

Degrees/Diplomas/Fellowships:

1973 B.Sc (Hons)	University of New South Wales
1982 Ph. D (Biological Sciences)	University of New South Wales
1984 Dip. Ed. (Science)	University of New England
2001.	Fellow of the Royal Zoological Society of NSW

Scientific Societies/Honoraria:

Honorary Batrachiologist	Taronga Zoo, Sydney (since 1981).
Council Member	Royal Zoological Society of New South Wales (since 1978)
Council member / President	Riversleigh Society (since 1987)
Member	Australian Society of Herpetologists (since 1978)
Scientific Adviser	Frog and Tadpole Study Group (1992-97)
President	Frog and Tadpole Study Group of NSW (since 1998)
Research Associate	School of Biological Sciences, University of NSW (1989-1998)
Honorary Research Fellow	Australian Museum (since 1999)

Fellow of the Royal Zoological Society of New South Wales (2001)

Brief Resume of Activities:

- Director of Biosphere Environmental Consultants Pty Ltd, a company that specialises in fauna-related projects

- Dr White has been involved in field surveys and studies on native fauna since 1978. These have included all vertebrate groups but special expertise has been developed in the area of threatened and endangered herpetofauna (frogs and reptiles).
- Dr White has been involved in various aspects of frog research in Australia since 1979. This research has included studies of the natural history, distribution, conservation status and ecology of a range of species (see publication list).
- Other major research areas include the taxonomy of fossil and modern turtles, bats and various reptiles (see publication list)
- Biosphere Environmental Consultants have undertaken various major and minor faunal studies on behalf of both private and government agencies. These include general fauna surveys, targeted surveys for threatened and endangered species, Species Impact Statement, Plans of Management and habitat management and creation programs.
- Dr White is an adviser to the NSW Scientific Committee (National Parks and Wildlife Service) and a member of the Departments of Environment, Climate Change and Water (DECCW) Native Animal Keepers Consultative Committee.
- Dr White has conducted targeted surveys for various threatened frogs species on behalf of the DECCW (National Parks and Wildlife Service), and these include surveys for Red-crowned Toadlets (Lane Cove NP, Royal NP), Giant Burrowing Frog (Booderee NP), Green and Golden Bell frogs (Mid-north coast region, Myall Lakes NP, Jervis Bay NP), Stuttering Frog (Macquarie Pass NP, Watagan NP, Ourimbah NP, associated state forests), Giant Barred Frogs (Watagan NP, Ourimbah NP, Gloucester Valley and associated state forests).
- Dr White has been involved in frog and reptile habitat construction and wetlands design at Sydney Olympic Park, Kurnell, Arncliffe, Woonona, Long Reef, Wollongong, Enfield and Rosebery.

Selected Recent Faunal Statements, Major Surveys and Management Plans

- 2013 Fauna Impact Statement. Ash Island remediation Site. Newcastle Coal Infrastructure Group
- 2012 Management Plan. Pink-tailed Worm Lizard. Dubbo Zirconia Project. Alkane Resources
- 2011-2013 Survey and Population Study. Giant Barred Frog, Gloucester Valley. Gloucester Coal Pty Ltd.
- 2010. Fauna Survey. Abel Mine Lease Area, Stockrington. Donaldson Coal.
- 2009-2010. Fauna survey Holsworthy Military Area (with URS).

- 2008-09 Pre-mining Impact Assessment, Fauna Survey, Illawarra Coal Precinct. Billiton BHP.
- 2008-2010. Monitoring and Impact Assessment. Threatened Species. Kooragang Island. Newcastle Coal Infrastructure Group.
- 2008. Plan of Management. Green and Golden Bell frogs. Port Kembla Coal terminal.
- 2008. Impact Assessment. V-8 Super-car. Sydney Olympic Parklands.
- 2008 Ryde Flora and Fauna Study. Ryde City Council.
- 2007-2009. Threatened species monitoring. Desalination Plant, Kurnell.
- 2007. Plan of Management. Green and Golden Bell frogs. ILC Site Enfield. Sydney Ports.
- 2007. Fauna Surveys and Impact Assessment. Coal Emplacement Site. Metropolitan Colliery Helensburgh.
- 1996/2007Monitoring program: Green and Golden Bell Frogs, Olympic Site, Homebush Bay. Olympic Co-ordination Authority and AMBS.

Publication List

White, A. W. 2012. Gulf Snapping Turtle *Elseya lavarackorum*. In *Queensland's Threatened Animals*. Ed. Curtis L.K., Dennis, A.J., McDonald, K.R., Kyne, P.M. and Debus, S.J.S. Pp 199-200.

White, A.W. and G.H. Pyke, 2011. World War II and the rise of the plague minnow *Gambusia holbrooki* (Girard, 1859) in Australia. Australian Zoologist 35(4) 1024-1032.

White, A.W. 2011.Roosting dynamics of Eastern Bent-wing Bats *Miniopterus schreibersii oceanensis* in disused military areas in eastern Sydney. In "The Biology and Conservation of Australasian Bats". Eds. B. Law, P. Eby, D. Lunney and L. Lumsden. Royal Zoological Society of New South Wales, Mosman. Pp 471-480.

White, A.W. 2011. Factors in the Design of an urban microbat flyway. In "The Biology and Conservation of Australasian Bats". Eds. B. Law, P. Eby, D. Lunney and L. Lumsden. Royal Zoological Society of New South Wales, Mosman. Pp 464-470.

White, A.W. 2010. The distribution and conservation status of Barred frogs in the Sydney Basin. Part 3: Great Barred Frog *Mixophyes fasciolatus*. Herpetofauna 40(2): 76-87.

White, A.W. 2010. The Herpetofauna of the Kurnell peninsula. Herpetofauna 40(2): 66-75.

White, A.W. 2010. The natural history of western Botany Bay. In "The Natural History of Sydney", eds. D. Lunney, P. Hutchings and D. Hochuli. Royal Zoological Society of New South Wales, Mosman. Pp 402-414.

White, A. W., Worthy, T.H., Hawkins, S., Bedford, S., and M. Spriggs. 2010. Megafaunal meiolaniid horned turtles survived until early human settlement in Vanuatu,

Southwest Pacific. Proceedings of the National Academy of Science 107(35):15512- 6.

White, A. W., and R. Shine. 2009. The extra-limital spread of an invasive species via "stowaway" dispersal: toad to nowhere? Animal Conservation 12:38-45.

White, A.W. 2008. Predation of frogs in northern Australia by pigs. Herpetofauna 38(1): 35- 38.

White, A.W., Magarey, E., Barker, C., and N. Williams. 2008. The distribution and conservation status of Barred frogs in the Sydney Basin. Part 2: Stuttering Frog *Mixophyes balbus*. Herpetofauna 38(2): 84-95.

White, A.W. 2008. The distribution and conservation status of Barred frogs in the Sydney Basin. Part 1: Giant Barred Frog *Mixophyes iteratus*. Herpetofauna 38(1): 24-34.

White, A.W., and G.H. Pyke. 2008. Green and Golden Bell frogs in New South Wales: current status and future prospects. Australian Zoologist 34(3): 319-333.

G.H.Pyke, J.Rowley, J.Shoulder and A.W.White. 2008. Attempted reintroduction of the Green and Golden Bell Frog to Long Reef Golf Course: a step towards recovery? Australian Zoologist 34(3): 361-372.

White, A.W., and G.H. Pyke. Frogs on the Hop: translocations of Green and Golden Bell Frogs *Litoria aurea* in Greater Sydney. Australian Zoologist 34(3): 249-260.

White, A.W. 2008. May I touch that frog? In *Too Close for Comfort- Contentious Issues in Human-wildlife Encounters*. Ed. D. Lunney, A. Munn and W.Meikle. Royal Zoological Society of New South Wales, Mosman. Pp 45-48.

White, A.W. 2007. Living with Bufo. In *Pest or Guest- the zoology of overabundance*. Eds. D. Lunney, P. Eby, P. Hutchings and S. Burgin. Royal Zoological Society of New South Wales, Mosman. Pp 16-29.

White, A.W. 2007. Herpetofauna of the Malabar Headland. Herpetofauna 37(1): 36-41.

White, A.W. 2006. A trial using salt to protect Green and Golden Bell frogs from Chytrid infection. Herpetofauna 36(2): 93-96.

White, A.W. 2004. Frogs as Bio-indicators. Frog Facts 9:1-4. Frog and Tadpoles Study Group of New South Wales

White, A.W., and S. Burgin. 2004. Current status and future prospects of reptiles and frogs in Sydney's urban-impacted bushland reserves. In "Urban Wildlife: more than meets the eye", Ed. D. Lunney and S. Burgin. Royal Zoological Society of New South Wales, Mosman. Pp109-123.

White, A.W. (2003). Herpetofauna of Boodjamulla National Park and the Riversleigh World Heritage Area, north-western Queensland. Herpetofauna 33(2): 65-77.

White, A.W. (2003). Herpetofauna of the Riversleigh World Heritage Area and Boodjamulla National Park, north-western Queensland. Riversleigh Notes 55:6-10.

White, A.W. and G.H. Pyke (2002). Captive frog egg numbers- a misleading indicator of breeding potential. Herpetofauna 32(2):102-109.

White, A.W. (2002). A new Eocene soft-shelled turtle (Trionychidae) from Murgon, south-eastern Queensland. *Memoirs Assoc. Australasian Palaeontologists* **25**: 37-43.

Pyke, G.H., White, A.W., Bishop, P.J., and Waldman, B. (2002). Habitat-use by Green and Golden Bell frog *Litoria aurea* in Australia and New Zealand. *Australian Zoologist* **32**(1): 12-31.

White, A.W. (2002). Eel and tadpole predation by the Red-bellied Black Snakes. *Herpetofauna* **31**(2): 119-122.

White, A.W. (2001), Canada's Fossil Trail. Exploration of World Heritage and other Fossil Sites in Canada.*Riversleigh Notes* **50**: 4-7.

Pyke, G.H. and A.W. White (2001). A Review of the Biology of the Green and Golden Bell Frog *Litoria aurea. Aust. Zool.* **31**(4): 563-598.

White, A.W. (2001).Editor. *Frog Diseases and Frog Hygiene*. Special Publication of the NSW Frog and Tadpole Study Group Inc. Pp 1- 127.

White, A.W. (2001). Frogs of the Sydney Region. *FrogFacts* 7: 1- 4. NSW Frog and Tadpole Study Group Inc.

Voigt, L. and White, A.W. (2001). . Collecting, Raising and Releasing Tadpoles *FrogFacts* 6: 1- 4. NSW Frog and Tadpole Study Group Inc.

White, A.W. (2000). Where to find fossils in Australia. *Riversleigh Notes* **45**: 21-30.

Pyke, G.H., and A.W.White. (2000). Factors influencing predation on eggs and tadpoles of the endangered Green and Golden Bell Frog *Litoria aurea* by the introduced Plague Minnow *Gambusia holbrooki. Aust. Zool.* **31**(3): 496-505.

White. A.W. 1999. Frogs as Bio-indicators. In " Blue Mountain Bioindicators Project". Urban Run-off Control Program/ NSW National Parks and Wildlife Service. Chapter 5.

White, A,W, and G.H.Pyke (1999) Past distribution of *Litoria aurea* and *Litoria castanea* in the Bathurst-Orange District of New South Wales.

Herpetofauna **29** (1): 2-9.

Pyke, G.H., and A.W.White (1999). Dynamics of co-occurring frog species in three ponds utilised by the endangered Green and Golden Bell Frog *Litoria aurea.*

Aust. Zool. **31**(1): 230-239.

White, A.W. (1999) Initial observations and survey results of Freshwater turtles in the Gregory River and Lawn Hill Creek, northwestern Queensland. *Herpetofauna* **29** (2): 37-48.

Thomson, S. White, A.W., and Georges, A. (1997) Re-evaluation of *Emydura lavarackorum*: identification of a living fossil. *Memoirs of the Queensland Museum* **42**: 327-336.

White. A.W. (1997). Green and Golden Bell Frog *Litoria aurea.* In

Threatened Frogs of New South Wales. Ed. H.Ehmann. Frog and Tadpole Study Group of New South Wales.Pp 149-156.

Ehmann, H., and A.W.White (1997). The Southern Bell Frog *Litoria raniformis*.In

Threatened Frogs of New South Wales. Ed. H.Ehmann. Frog and Tadpole Study Group of New South Wales.pp 195-202.

White. A.W. and Ehmann ,H (1997). The New England Bell Frog *Litoria castanea.* In

Threatened Frogs of New South Wales. Ed. H.Ehmann. Frog and Tadpole Study Group of New South Wales. Pp 165-170.

White. A.W. and Ehmann, H (1997). The Southern Tablelands Bell Frog *Litoria castanea* (part). In *Threatened Frogs of New South Wales*. Ed. H.Ehmann. Frog and Tadpole Study Group of New South Wales.Pp 171-176.

White. A.W. (1997). Heath Frog *Litoria littlejohni.* In *Threatened Frogs of New South Wales*. Ed. H.Ehmann. Frog and Tadpole Study Group of New South Wales. Pp 177-182.

White, A.W. (1997) Cainozoic turtle assemblages from Riversleigh, northwestern Queensland. *Memoirs of the Queensland Museum* **41**: 413-421.

White, A.W., and G.H. Pyke (1996). Distribution and conservation status of the Green and Golden Bell Frog *Litoria aurea* in New South Wales.

Aust. Zool. **30**: 177- 189.

Pyke, G.H., and A.W.White. (1996) Habitat requirements of the Green and Golden Frog *Litoria aurea* (Anura:Hylidae). *Aust. Zool.* **30**: 224-232.

Thomson, S., White, A.W., Adams, M., and Georges, A. (1996). A synthesis of diverse disciplines: How *Elseya lavarackorum*, the Gulf Snapping Turtle (Testudines: Chelidae) was identified as a living fossil.

Aust. Soc. Herpetologists Newsletter **38:** 112. (abstract).

White, A.W. (1995). Disappearing frogs. *Aust. Zool.* **30:**1-9.

White, A.W. (1995) The Green and Golden Bell Frog *FrogFacts* **5**:1-4.

White, A.W. (1995) Dead Turtles Fight Back. *Riversleigh Notes* **28**: 5.

White, A.W., and G.H.Pyke (1995). Breeding biology and conservation status of *Litoria aurea* in New South Wales. Newsletter Aust. Herp. Soc. **37**: 133.

White, A.W. (1994). The fossil history of soft-shelled turtles.

Riversleigh Notes **24**: 2 - 4.

White, A.W., R.W. Whitford, and M.J. Mahony. (1994). A new species of *Litoria* (Anura:Hylidae) from eastern Australia. *Proc. Linn. Soc. N.S.W.* **114**: 3-10.

White, A.W., and M. Archer. (1994). *Emydura lavarckorum*, a new pleistocene turtle (Pleurodira:Chelidae) from fluviatile deposits at Riversleigh, northwestern Queensland. *Rec. Sth. Aust. Mus.* **27:** 159-167.

White, A.W. (1993) Ecological and behavioural observations on the toadlets *Pseudophryne coriacea* and *Pseudophryne bibronii* on the central coast of New South Wales. In *"Herpetology in Australia, a diverse discipline"*, eds

D. Lunney and D. Ayers. Trans. of the Royal Zoological Society of New South Wales. Pp139-149.

White, A. W. (1991b). Playing in the Purple Pit. Riversleigh's Notes 12: 6-7. (Report

on fossil excavations in southeast Queensland).

White, A.W. (1992a). Riversleigh's midget submarines. Riversleigh's Notes 16: 4-5.

(First report of dwarf Chelid turtles from Riversleigh).

White, A. W. (1992b). Edentology - teeth, who needs them ?

Riversleigh Notes 17: 2-3.

Gaffney, E.S., Archer, M. and A.W. White (1992). *Warkalania*, a new meiolanid turtle from the tertiary Riversleigh deposits of Queensland, Australia.

Records Northern Terr. Mus. Sci. **9: 35-48.**

White, A.W. (1991a). Ripping along with the Lesser Ripper. Riversleigh Notes 14: 2 -6

(First report of Riversleigh Meiolanid turtles).

White, A.W. (1990a). Murgon's Salad Bowl. Riversleigh Notes 10: 6-7. (First morphological report of Eocene trionychid turtles in Australia).

White, A.W. (1990b). Frogs, in "Care and Handling of Australian Native Animals",

S. Hand (ed). Surry Beatty and Sons, Chipping Norton. Pp 17-42.

White, A.W. and M. Archer (1989). Riversleigh's turtles - so far. Conference on Aust. Verteb. Evol. Systematics abstract p17.

Gaffney, E.S., Archer, M. and A.W. White (1989). Chelid turtles from the miocene limestone of Riversleigh Station, north western Queensland. *Amer. Mus. Novitat.* **2959: 1-10.**

White, A.W. (1988). Riversleigh's turtles - all shell be revealed.

Riversleigh Notes 4: 3-4.

White, A.W. (1984a). Origin and early radiation of amphibians, in "Vertebrate Zoogeography and Evolution in Australasia", M. Archer and G. Clayton (eds)

Hesperian Press, Perth. Pp255-261

White, A. W. (1984b). Zoogeography of Australian Amphibians, in "Vertebrate Zoogeography and Evolution in Australasia", M. Archer and G. Clayton (eds).

Hesperian Press, Perth. Pp 283-289.

Whitford, D., Fanning, D. and A.W. White (1982). Some information on the reproduction, growth and development of *Planigale gilesii*, in "Carnivorous Marsupials" vol. 1. (p78-81). M. Archer (ed). Royal Zool. Soc. N.S.W. Sydney

White, A. W. (1981). Insulin-like activity in grey kangaroo serum.

Bull. Aust. Mammal Soc. **7: 64-65.**

White, A.W., Whitford, D. and G. Watson (1980). A redescription of the Jervis Bay tree Frog *Litoria jervisiensis* (Anura: Hylidae), with notes on Krefft's Frog (*Litoria kreffti*). *Aust. Zool.* **20: 375-390**.

White, A. W. (1980a). Zoogeography of the Amphibia, in "Aspects of Australian Vertebrate Zoogeography". M. Archer (ed).

University of New South Wales Press, Sydney.

White, A. W. (1980b). Biogeography of Australian Amphibians, in "Aspects of Australian Vertebrate Zoogeography", M. Archer (ed). University of New South Wales Press, Sydney.

White, A.W. and D. Whitford (1978). A new species of trees frog in New South Wales. *Bull. Aust. Herp. Soc*. **1978:12.**

White, A. W. and the late C.J.F. Harrop (1978). Ontogeny of Kangaroo pancreas.

Bull. Aust. Mammal Soc. **3: 18-19.**

White, A.W. (1978). Insulin receptor proteins in the erythrocytes of monotremes and other vertebrates. *Aust. Zool*. **19: 327-334.**

White, A.W. and C.J.F. Harrop (1977). The ontogeny of kangaroo pancreas. *Aust. J. Zoology* **26: 487-499**.

White, A. W. and C.J.F. Harrop (1975a). The islets of Langerhans of macropodid marsupials: a comparison with eutherian species. *Aust. J. Zoology* **23: 309-319**.

White, A. W. and C.J.F. Harrop (1975b). The islets of Langerhans of macropodid marsupials. *Bull. Aust. Mammal Soc*. **3: 33.**

Curriculum Vitae: TEAM MEMBER

Dr. Gilbert Whyte

Senior Ecologist: Kleinfelder Pty Ltd

Gilbert Whyte is an Ecologist with a PhD from Murdoch University in Western Australia. Gilbert's main expertise is botany, which typically involves floristic surveys, vegetation mapping, and targeted threatened flora surveys.

Gilbert also has an entomological research background which he has incorporated into his role as an environmental consultant. Projects include using invertebrate species as indicators of ecosystem functionality in mine site rehabilitation.

Gilbert has good project management experience and strong report writing abilities which include the preparation of ecological assessments, environmental management plans, monitoring plans, offset strategies and conservation agreements.

QUALIFICATIONS / LICENSES

Ph.D. Murdoch University WA.

Bachelor of Biological Sciences (1st Class Honors). La Trobe University Vic.

Senior First Aid

4WD Driver Training

Relevant Mine Site Inductions (QLD and NSW)

WorkCover NSW OHS General Induction

Snake Safety and Management Course

Australian River Assessment System (AUSRIVAS): Enrolled 2013.

Project Experience

The following is a representative selection of Gilbert Whyte's project experience.

Flora and Fauna

- **Vegetation Clearing Surveys for Santos (Injune, QLD):** Flora surveys within easements to be cleared for coal seam gas development. Vegetation communities were identified and mapped, threatened species were relocated.
- **Flora and Fauna Impact Assessment for the Newcastle AGL Gas Storage Facility (Tomago, NSW 2012):** Several phases of work including baseline flora and fauna surveys, vegetation mapping, targeted searches for threatened flora and the preparation of habitat and vegetation management plans.

- **Vegetation Mapping of Bulga Underground Coalmine (Bulga NSW):** The development of an accurate vegetation community map involved the identification of over sixteen vegetation communities (1300 ha area).

- **Annual Biodiversity Monitoring for Coalpac Coal Mine (Lithgow, NSW).** Fulfilment of the annual monitoring requirements of Coalpac's Biodiversity Management Plan. The monitoring of flora and fauna assemblages using a range of techniques within conservation areas and biodiversity offset areas.

- **Due Diligence Assessments for Coal Quality Boreholes for Oceanic Coal Xstrata (Killingworth, NSW):** The assessment of ecological and archaeological features of coal quality borehole locations within the vicinity of the existing West Wallsend Colliery (WWC) mine workings.

- **Spotter Catcher for Vegetation Clearing at Grosvenor Coal Mine, BMD Construction (Moranbah, QLD)**: The supervision of vegetation clearing activity within the Grosvenor mine site. All habitat trees within the site were felled using the "soft felling" technique. All fauna species were captured and relocated.

- **Entomology**

- **Invertebrate Surveys for Mine Site Rehabilitation (Charbon Coal Mine NSW, Xstrata Coal Mine Bulga NSW, Meandu Coal Mine Tarong QLD)**: Examination of invertebrate assemblages in rehabilitation areas to assess ecosystem functionality. A broad range of invertebrate groups were used as bio indicators.

- **Macro-Invertebrate Surveys in the Upper Hunter Council Area (Scone, Merriwa, Singleton)**. The identification of invertebrate specimens to family level. Analysis of SIGNAL scores within several freshwater habitats.

- **Canopy Health Assessment of Bell Miner Associated Dieback for the Office of Environment and Heritage (Blue Mountains National Park, NSW)**. Assessment of Bell Minor Associated Dieback (BMAD) at several sites. Collection of baseline data including floristic surveys, bird surveys, and entomology surveys. Psyllid species were collected and identified to genus and species level.

- **Targeted Searches for the Threatened Shield Back Spider (*Idiosoma nigrum*), Midwest Metals (Weld Range, WA)**: Mapping spider populations within the exploration site. Specimens were also collected for molecular research (population structure).

- **Ant Surveys and Habitat Assessment for the Pink Worm Lizard (Aprasia parapulchella), Dubbo Zirconia Project (Dubbo, NSW)**: Identification of ant species within the habitat of the threatened Pink Worm-tailed Lizard (*Aprasia parapulchella*), which feeds exclusively on ant broods. A monitoring program was implemented.

Rehabilitation & Soil Surveys

- **Development of Completion Criteria for Coppabella Coal Mine, Peabody (Coppabella, QLD)**: Assessment of rehabilitation areas (floristic structure, habitat value, soil chemistry and erosion control). Completion criteria were developed and research trials were implemented.

- **Soil Survey of a Limestone Quarry, Sibelco (Wombeyan caves, NSW):** Assessment of soil structure within rehabilitation areas. Soil analysis was used to provide recommendations to improve soil chemistry to optimise plant growth.

- **Land Capability Assessment at Invincible Colliery and Cullen Valley Mines, Coalpac (Lithgow, NSW):** Soil sampling and mapping throughout the site. Application of land capability classification.

Professional Associations

- The Australian Entomology Society
- The Australian Plant Society
- Australian Network for Plant Conservation
- The Ecological Society of Australia
- Australian Systematic Botany Society
- The Weed Society of New South Wales

Publications

- Whyte, G., Burgess, T.I., Barber, P.A., Hardy, G.E.St J. 2005. First record of *Mycosphaerella heimii* in Australia. Australasian Plant Pathology. 34, 605-606.
- Whyte, G., Andjic, V, Hardy, G., Burgess, T. 2010. New *Teratosphaeria* species occurring on eucalypts in Australia. Fungal Diversity. 43(1), 27-38.
- Whyte, G., Howard, K., Hardy, G., Burgess, T. 2011. Pests and Pathogens of Eucalypt Plantations in Southern Queensland. Australian Forestry. 74 (3), 161-169.

- Whyte, G. 2003. Honours Thesis. Relationships of Insects and Fungi Associated with Foliage of *Eucalyptus camaldulensis* (Myrtaceae) in the Gresswell Forest Reserve. La Trobe University. Melbourne, VIC.

- Whyte, G. 2012. PhD Thesis. The Ecology of Insect Pests and Fungal Pathogens of Drought Stressed Eucalypt Plantations in Southern Queensland. Murdoch University. Perth, WA.

- Whyte, G. 2005. Insects and other Invertebrates. In 'A Guide to Wildlife of the Perth Region'. (Editor: S. Neville). Simon Neville publications.

Curriculum Vitae: TEAM MEMBER

Phillip Cameron (BSc, Ass. Dip. App. Sci):

Principal Ecologist and Senior Project Manager OzArk Environmental & Heritage Management

---

QUALIFICATIONS

2013	TAFE NSW – BIOCERTIFICATION COURSE (MAY 2013)
2011	INDIVIDUAL SUBJECTS: CHARLES STURT UNIVERSITY MASTER OF GIS AND REMOTE SENSING.
2010	TAFE NSW – BIOBANKING COURSE (JULY 2010)
2005	TAFE CERTIFICATE FINE ART
2002	TAFE NSW – CERTIFICATE IN FINE ARTS (MICROSOFT PHOTOSHOP)
1996 – 2001	BSC. (BIOLOGY) MACQUARIE UNIVERSITY, SYDNEY.
1992 – 1994	TAFE CERTIFICATE ZOOLOGY
1992	TAFE CERTIFICATE SMALL BUSINESS
1989 - 1991	ASSOCIATE DIPLOMA OF APPLIED SCIENCE – QUARANTINE INSPECTION, STOCK INSPECTION & MEAT INSPECTION. UNIVERSITY OF QUEENSLAND.

FIELD OF EXPERTISE

PHILLIP HAS BEEN EMPLOYED AS A PROJECT MANAGER, ECOLOGIST AND ARCHAEOLOGICAL ASSISTANT WITH OZARK ENVIRONMENTAL & HERITAGE MANAGEMENT P/L SINCE 2004. HAVING UNDERTAKEN NUMEROUS FIELD ASSESSMENTS, PROJECT MANAGING AND WRITING REF'S, SOEI'S AND EIS'S.

PREVIOUS TO OZARK, PHILLIP GAINED 12 YEARS' EXPERIENCE WITH THE NSW PUBLIC SERVICE, WHICH INVOLVED SEVERAL POSITIONS ALL DIRECTLY RELATED TO NATURAL RESOURCE MANAGEMENT, POLICY DEVELOPMENT, PROJECT MANAGEMENT, THE CONSERVATION AND MANAGEMENT OF SPECIES, ECOTOURISM AND THE MANAGEMENT OF PEOPLE. DURING AND AFTER THE NSW PUBLIC SERVICE, PHILLIP HAS UNDERTAKEN CONSULTANCY WORK, ASSISTING WITH PREPARATION, FIELD WORK AND REPORT WRITING FOR FLORA / FAUNA AND CULTURAL HERITAGE AND ENVIRONMENTAL IMPACT ASSESSMENTS.

RELEVANT EXPERIENCE

2004 – Present principal ecologist and senior project manager & ecologist OzArk environmental heritage management p/l. Responsibilities:

- Plan and undertake flora / fauna field surveys, fauna monitoring for large infrastructure projects, linear development projects and small local projects, opportunities and constraints assessments;
- Fauna and flora identification;
- Plan and undertake trapping programs;

- Undertake 7-part tests, assessments of significance, referrals.
- Project management;
- Mentor and train new ecological recruits;
- Report writing: terrestrial flora/fauna reports, aquatic flora/fauna reports, review of environmental factors, environmental overviews, statement of environmental effects, management plans (flora fauna and heritage), species impact statements, archaeological reports, aboriginal heritage reports, aboriginal heritage impact permits;
- Manage archaeological teams, assist with archaeology surveys, excavations and identify indigenous and non-indigenous heritage values;
- Liaise with diverse client base, community stakeholders, OEH threatened species unit, aboriginal community consultation, external authorities, contractors and the general public.

2003 **V**arious infrastructure and development projects for OzArk.

2002 Broken Hills Living Desert Wildlife Sanctuary development.

1998 – 2002 REF reports for the Zoological Parks Board of NSW:

- Armati education centre
- Indian rhino and otter exhibits
- New bike hire and maintenance shed facilities
- Obley Road precinct redevelopment and upgrade

Development of the Genaren hill sanctuary

1998 – 2001 CRC for sustainable tourism – various short consultancies.

Development of the Australian native fauna and flora sanctuary – Western Plains Zoo

LICENCES / QUALIFICATIONS

- BSC (BIOL), ASS DIP APP SCI (VET & PUBLIC HEALTH), MECA.
- ETHICS APPROVAL NO 11/5865 (NSW TRADE & INVESTMENT (PRIMARY INDUSTRIES))
- SCIENTIFIC RESEARCH LICENSE S101787 (NSW OFFICE OF ENVIRONMENT AND HERITAGE).
- BIOBANKING CERTIFICATE (BIOBANKING ASSESSOR ACCREDITATION NUMBER 0117)
- ZOO KEEPING TAFE CERTIFICATE 1992.
- OEH DATA LICENSE AGREEMENT: CON:99042.
- WORK COVER OHS WHITE CARD NO: CG100846479SEQ1
- QLD OHS BLUE CARD 455935
- FIRST AID CERTIFICATE (2012 TO 2015) CERT NUMBER: PARASOL 000897572

TEACHING EXPERIENCE

1998 – 2002 Charles Sturt university – post graduate certificate in captive vertebrate management,

Wildlife management – protected area management and wildlife reintroduction component (3 day residential schools only per year per subject).

Reproductive biology - cytology component (3 day residential schools only per year per subject).

1998 – 2001 Australian conservation training institute (acti)

Protected area management and environmental / ecological management within protected areas component.

On behalf of the Zoological Parks Board of NSW.

1998 – 2001 CRC for sustainable tourism ½ day courses:

Protected area management to Bhutanese government delegates.

1994 – 1995 TAFE NSW – zookeeping course subject:

Toxicology, poisonous plant identification and parasitology

COMMITTEE REPRESENTATION

2002 Lower Macquarie / Castlereagh native vegetation advisory committee. Deputy conservation representative. Reporting to hon Richard Amery minister land and water conservation.

2002 national parks and wildlife advisory committee – upper darling. Full committee representative. Reporting to hon Bob Debus minister for the environment.

EXPERT PANEL REPRESENTATION

2002 **C**onservation assessment criteria project (ecology) brigalow belt south bioregion - western regional assessment for the resource and conservation assessment council (RACAC)

2002 **E**cologically sustainable forest management – State Forests Western Region.

PAPERS

Cameron, P.J. (1998) "progress in the Australian native fauna and flora sanctuary 1998" *in* captive vertebrate management - wildlife management, captive breeding - release programs as adaptive experiments : Charles Sturt university, Bathurst.

Cameron, P.J. (1999) " report on the death of a bridled nailtail wallaby (*Onychogalea fraenata)* post release at genaren hill sanctuary peak hill N.S.W." *in* captive vertebrate management - wildlife management, captive breeding - release programs as adaptive experiments : Charles Sturt University, Bathurst.

Cameron, P.J. , Blyde, d.j., & Sutherland, m. (1999) "report on the release of captive born a bridled nailtail wallaby (*Onychogalea fraenata)* from western plains zoo to genaren hill sanctuary peak hill N.S.W - a six month overview." *in* captive vertebrate management - wildlife management, captive breeding - release programs as adaptive experiments : Charles Sturt University, Bathurst. Also a report to the recovery national team.

Blyde, d.j., Cameron, P.J. ., & Thorne, A.R., the Australian native fauna and flora sanctuary at western plains zoo, Dubbo, Australia" international zoo news vol.46, no.5 (1999), pp. 270 - 278

Cameron P.J. and Gibbons j. (2000) "the ecology of habitat restoration at western plains zoo Dubbo" *ARAZPA conference paper, sea world 20th - 24th June.*

Cameron, P.J. and Briggs a. (2000). Natives for natives: repairing native grasslands. *Better pastures naturally conference paper, stipa native grasses association Mudgee 16th - 17th march*

Cameron, P.J. and Engle d. (2001) "natural resource management – its role in ecotourism enhancement and sustainability" *ARAZPA conference paper, western plains zoo Dubbo – july.*

Cameron P.J. and Bauer (2001) "integrating zoo tourism and native species reintroduction at western plains zoo Dubbo" *crc for sustainable tourism 1st annual conference Hobart – November.*

Cameron, P.J. (2002) new millennium conservation 1 and 2 "the role of and management of protected areas" *in* captive vertebrate management - wildlife management, captive breeding - release programs as adaptive experiments : Charles Sturt university, Bathurst.

Cameron, P.J. Jerskin, v. (2002) *achieving biodiversity outcomes via the thinning of cypress pine*. A report to the environment minister and the resource and conservation assessment council

External reports

2002 **C**ypress pine thinning report (*achieving biodiversity outcomes via the thinning of cypress pine)* jointly for the resource and conservation assessment council (RACAC) and the minister for the environment

2002 **S***ugar glider autecology* for the resource and conservation assessment council (RACAC) as part of the western regional assessment.

HEIDI KOLKERT *BA- BSc (Hons)*

Ecologist OzArk Environmental & Heritage Management

PO BOX 2028 Armidale, NSW 2350 ☎ 0418 324 136

Email: heidi@Ozarkehm.com.au / hkolkert@myune.edu.au

EDUCATION	
2013	University of New England PhD Candidate.
2005	University of Tasmania Graduated with Honours in Science. Thesis title: The link between Devil Facial Tumour Disease and Reproduction and Endocrinology in the Tasmanian Devil.
2004	University of Tasmania Graduated with a Bachelor of Science and Bachelor of Arts. Double major in Zoology, Major in Geography and Environmental Studies and Journalism.
WORK HISTORY	
Ecologist/Project Officer (5+ years) February 2013 to Current – Part time June 2008 to February 2013– Full time March 2008 to June 2008– Part time	Employer: OzArk Environmental and Heritage Management Responsibilities; Plan and undertake flora / fauna field surveys, fauna monitoring for large infrastructure projects, linear development projects and small local projects, opportunities and constraints assessments; Fauna and flora identification; Plan and undertake trapping programmes; Undertake 7-part tests, Assessments of Significance, Referrals. Project management; Mentor and train new ecological recruits; Report writing: Terrestrial flora/fauna reports, aquatic flora/fauna reports, Review of Environmental Factors, Environmental Overviews, Statement of Environmental Effects, Management Plans (flora fauna and heritage), Species Impact Statements, Archaeological reports, Aboriginal heritage reports, Aboriginal Heritage Impact Permits; Assist with archaeology surveys, excavations and identify Indigenous and Non-Indigenous heritage values; Liaise with diverse client base, community stakeholders, OEH Threatened Species Unit, Aboriginal community consultation, external authorities, contractors and the general public.
Zoo Keeper (Weekends) 2008 to 2012	Employer: Taronga Conservation Society Australia Responsibilities; Captive husbandry of the zoos collection of animals; preparing diets; conditioning routines; Daily report writing; Assist in breeding programs; Public presentations;

Reproductive Technician **2008 (6 month contract)** **January to June**	Employer: Taronga Conservation Society Australia Responsibilities; Provide routine reproductive monitoring of a variety of zoo species; Provide professional reproductive advice and write reports for internal and external service work; Undertake EIA's for hormone analysis.
Waste Management Officer / Waste Management Coordinator 2006-2007	Employer: Glenorchy City Council Responsibilities; Provide Scientific/technical support into the operations of the landfill, including environmental monitoring, environmental regulatory compliance and also the continual improvement and compliance of the Environmental management System (EMS) for the operation of the landfill; Undertake and manage a portfolio of projects from initial concept to completion Manage, monitor and meet agreed budget allocations; Assist in the development of the financial year budget, including setting fees and charges; Implement municipal waste management strategies and kerbside collection services; Liaise with community stakeholders, external authorities, contractors and the general public; Effectively and efficiently promote and advise on all aspects of Waste Management and Landfill Management. Design and produce media, educational and events literature about waste management services.
Wildlife Officer and Interpreter 2006	Employer: Bonorong Wildlife Park Responsibilities; Animal husbandry and handling of a variety of native marsupials reptile and bird species. Capture and restrain animals where necessary and transfer between locations. Practice wildlife training and conditioning. Record animal observations, making notes on unusual animal behaviour, signs of illness or injury, loss in appetite, start of breeding cycle, or lack of compatibility of other animals in the same enclosures Undertake animal management and population controls. Construct and maintain breeding programs and animal rotations. Treat injured, orphaned or sick animals and respond to public calls on injured and orphaned animals. Provide emergency animal care and advice. Shop for animal food and examine bushland for natural food supplements. Make animal feeds, distribute food and adjust diet sheets accordingly. Follow up on animal welfare issues. Make ongoing park and enclosure assessment, design and construct enclosures and general maintenance. Interact with park visitors and staff courteously and offer professional attention. Present talks to tour groups and the general public. Answer questions and give information regarding animals, operations and park exhibits to the visiting public. Construct and undertake educational programs for school groups.

Research assistant 2005	For PhD candidate Prue Loney Responsibilities; Husbandry of captive animals Note taking on experiments
Volunteer Tasmanian Devil Husbandry Officer 2005 January to December	For: DPIWE at Taroona Quarantine Centre Responsibilities; Follow strict quarantine procedures General maintenance and husbandry of Tasmanian Devils Enclosure design Prepare and maintain feeding regimes Enclosure maintenance and cleaning Behavioural enrichment Note taking and record maintenance Examine daily health and eating habits of animals
Volunteer Tasmanian Devil Trapper 2005 January to February	For: DPIWE at Taroona Quarantine Centre Responsibilities; Handling Tasmanian Devils Follow strict quarantine procedures Trapping devils around Tasmania Transporting devils around Tasmania Check and clean traps for animals Undertake morphological measurements
Zoology Demonstrator 2005 (1 year)	Employer: Zoology, University of Tasmania Responsibilities; Learn practical notes and assist students in practical sessions. Communicate ideas effectively to students and answer questions Demonstrate a knowledge of ecological and biological principles Demonstrate a sound knowledge of invertebrate zoology
2004 Entrepreneur /Event Manager Threatened Species Week Manager 'Under the Microscope'	Employer: Zoology Department at University of Tasmania Responsibilities; Coordinate people, paperwork, exhibit items for the event Liaise between the University and DPIW Organise people, finance and location of the event Organise specimens and information Ensure smooth running of event Public Relations Conduct feedback session for participants
Volunteer Field Assistant 2004	For PhD student at the University of Tasmania Responsibilities; Baiting fishing lines and 'fishing for lizards' Bagging and tagging lizards.
LICENCES	Scientific Research Licence under section 132C of the National Parks & Wildlife Act 1974. Animal Research Authority OH&S Induction Training for Construction Work – General Course. Class C Drivers Licence.

MEMBERSHIP / AFFILIATIONS	
	2013 Member of Australasian Bat Society **2013** Member of Australian Mammals Society **2011** Member of Birdlife Australia **2011** Member of Frog Network Australia **2010** Member of the Ecological Consulting Society of NSW since January 2010 **2003** Golden Key life membership
ACADEMIC ACHIEVEMENTS	
2013 Border Rivers-Gwydir CMA MERI PhD –Top up scholarship **2012** Australian Post-graduate Award – For commencement of PhD in 2013 **2005** Dr Eric Guiler scholarship in Tasmanian Devil disease ($5000) **2003** Excellent academic achievement at University of Tasmania (Golden Key) **1999** Pianoforte AMEB level 1-8 (all Honours)	
COURSES	
2013 University of New England Animal Ethics Course **2013** DPI Off-road 4WD course, vehicle recovery and maintenance **2012** Accredited BioBanking Assessor (No 0127). **2012** Senior First Aid **2008** Enrolled in Captive Management Certificate 3 TAFE (On hold- 1 unit from completion) **2007** Recruitment and Selection Training **2007** How to be a better communicator **2007** How to excel at managing and supervising people	
SEMINARS and CONFERENCES	
2011 Central West Catchment Management Authority – Biodiversity Conference (Dubbo) – 4 days	
SPORTING ACHIEVEMENTS	
2012 Northern New England Women's Premier League Football – Demon Knights 'Most Improved Player' **1996-2000** Tasmanian State Badminton teams. **2000** Tasmanian U19 State Badminton Team **2000** Rosny College award for excellence in sport -Badminton **1999** Tasmanian U19 State Badminton Team, Tasmanian ranking of (1) **1998** Captain of U17 State Badminton team **1998** Australian ranking of (7) Australasian ranking of (10) **1998** Tasmanian U17 Badminton ranking of (1) **1998** State U19 Badminton team	

APPENDIX 17: DZP SITE TEMPLATE FOR LAND MANAGEMENT ACTIONS*

Note*: A colour version of this Appendix is available on the Project CD

This page has been intentionally left blank

DZP Site Template for Management Actions

The following template has been adopted from BioBanking resources.

Instructions for completing the template for management actions

This template for management actions will be filled in by AZL and submitted to the Determining Authority for critique. Once Approvals are determined this template will be populated by the Proponent.

This template uses standard words and format for the management actions (refer to the *Guide to establishing a Biodiversity Offset Area* for guidance).

Once completed, the Determining Authority will review the management actions and plans and make any necessary amendments after consultation with AZL. These management actions will be incorporated into Mining Approvals Conditions of Consent.

There are four sections to this template:

1. **Standard management actions – mandatory.**
2. **Additional management actions – only if indicated by the assessment.**
3. **Standard management plans (weeds and fire for conservation) – mandatory.**
4. **Additional management plans (feral and overabundant herbivores and vertebrate pests) – only if indicated by the assessment.**

An additional short section is also included in this template that requires the details of photo points for monitoring purposes. This information will be incorporated into the Mining Approvals Conditions of Consent.

Green boxes like this one provide instructions and examples and will be deleted by AZL before the template for management actions is submitted.

Yellow highlighted fields will be customised by AZL once Approvals are determined. AZL will provide the information required; sometimes AZL will need to delete or retain provided options. It is important to note that AZL will ensure that, especially where fields are customised, that the management actions are certain, clear and specific so that it is clear what the requirements of the actions are.

The format and wording of standard and additional management actions will not be changed. Enter site specific information into the yellow highlighted fields required.

Management actions are divided into passive and active actions. Passive actions have little or no cost and include refraining from doing something, such as not removing fallen logs or bush rock. Passive management actions must be commenced as soon as Project Approvals are determined.

If a management action is active, AZL will undertake specific activities to improve the site's biodiversity. Active management actions only need to be commenced when the Integrated Land Management Plan (ILMP) has been approved. The ILMP will provide guidance for management of the Biodiversity Offset Area (BOA) and more broadly the Application Area.

In the table below, the timing column indicates:

- passive actions by the term 'Ongoing from commencement date'.
- active actions by a reference to 'Ongoing from ILMP approval.'.

Managing grazing for conservation can be passive or active depending on the specific conditions in the DZP Site or Biodiversity Offset Area. For example, managing grazing for conservation is a passive management action if the BOA is already suitably fenced, and it is an active management action if the BOA site needs to be fenced. Both options appear in the timing column and are highlighted yellow. AZL will delete whichever option is not applicable.

Section 1: Standard management actions

Standard management actions		
Item 1	**Management of grazing for conservation**	**Timing**
1.1	Stock must not be permitted to graze in any area of the Biodiversity Offset Area when there is less than xx% of living ground cover.	Ongoing from commencement date. Or Ongoing from ILMP approval.
	If no grazing is to be allowed, replace the above item with: 'Stock must not be permitted to graze in any area of the Biodiversity Offset Area.' Then delete the words in item 1.2 and 1.3 (but keep the numbering) and replace with: 'This item is not applicable'. The wording in the adjacent Timing column can also be deleted.	
1.2	Subject to item 1.1 above, stock must not be permitted to graze on the Biodiversity Offset Area except to improve biodiversity values. During month(s) AZL must stock no more than xx cattle, sheep, other (specify number of particular types of animal) and no less than xx cattle, sheep, other (specify number of particular types of animal) on the Biodiversity Offset Area/in management zone/s xx, xxx, xxxx only for no more than xx consecutive weeks in any 12 month period. AZL must make a record of the number and type of animals stocked at the Biodiversity Offset Area, the date/s they were stocked and de-stocked and the management zone/s where they were stocked and de-stocked. These records must be maintained in accordance with the record keeping requirements. Specific requirements: x	Ongoing from commencement date. Or Ongoing from ILMP approval.
	Insert any requirements specific to the site to accommodate local conditions and allow for flexibility in a framework of reasonable certainty. Delete 'Specific requirements:' if it is not relevant. AZL can prevent stock from grazing or require stock to graze in specific areas by erecting and maintaining stockproof fencing. Fencing may be permanent or temporary (including electric fences). Indicate the specific type and length of fence to be erected and by when. Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.	
1.3	Stock must not be permitted to be present on the Biodiversity Offset Area in areas where replanting has been undertaken in accordance with item 6 of this Section, except as specified in items 6.2 and 6.3.	Ongoing from commencement date. Or Ongoing from ILMP approval.

1.4	If, at any time, AZL observes stock in any area of the Biodiversity Offset Area, other than an area on the Biodiversity Offset Area where grazing is permitted, AZL must take necessary measures to remove the stock from the area immediately.	Ongoing from commencement date. Or Ongoing from ILMP approval.
Item 2	**Weed control**	**Timing**
2.1	AZL must implement and, at all relevant times, comply with, the integrated weed management plan included in Section 3 ('**the weed management plan'**) (or such updated integrated weed management plan as has been approved by the Determining Authority under item 2.2 below). To allow for adaptive management, minor alterations can be made to the implementation of the weed management plan. Any alterations must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from ILMP approval.
2.2	The weed management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Determining Authority in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Determining Authority within 3 months of commencing the review. Where the Determining Authority determines from the review that an update of the plan is required, the Determining Authority will notify AZL in writing that an update of the plan is required. AZL must update the plan and submit it to the Determining Authority for approval within 3 months of receiving written notification from the Determining Authority that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and must cover the matters outlined below and any additional matters specified by the Determining Authority in writing: • a description of the target weed/s at the Biodiversity Offset Area and their location/s, linked to each management zone where weeds are present • the method/s of weed control in each zone • the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species • the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities • methods for monitoring the success of weed control activities • a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*) • additional weed control activities to destroy or remove any new weed species that are found on the site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the weed	Ongoing from ILMP approval.

	management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
Item 3	**Management of fire for conservation**	**Timing**
3.1	AZL must implement, and at all relevant times, comply with the fire management plan included in Section 3 (or such updated fire management plan as has been approved by the Determining Authority under item 3.2 below) (‘**the fire management plan”)**. To allow for adaptive management and weather conditions, minor alterations can be made to the implementation of the fire management plan, and must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from commencement date. Or Ongoing from ILMP approval.
3.2	The fire management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Determining Authority in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Determining Authority within 3 months of commencing the review. Where the Determining Authority determines from the review that an update of the fire management plan is required, the Determining Authority will notify AZL in writing that an update of the plan is required. AZL must update the plan and submit it to the Determining Authority for approval within 3 months of receiving written notification from the Determining Authority that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and cover the matters outlined below and any additional matters specified by the Determining Authority in writing: • the year the last fire went through, the type of fire and the extent of the fire and location, where known • frequency of natural fires in the area of the Biodiversity Offset Area, where known • a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt • the methods that will be used for ecological burns • the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns • the fire intensity for the recommended vegetation types • the time of year suitable for ecological burns • the diary for recording actions taken in accordance with the fire management plan and minor alterations to fire management plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	Ongoing from ILMP approval.
3.3	Fires must not be lit on the Biodiversity Offset Area other than for the	Ongoing from

	purpose of ecological burning in accordance with the fire management plan or as permitted as a permissible human activity on the Biodiversity Offset Area under item 4 of this Annexure or clause 3.6 of this agreement. AZL controlled camping and cultural activities involving camp fires will be allowable as required.	commencement date.
Item 4	**Management of human disturbance**	**Timing**
4.1	Except as permitted under clause 3 of this agreement or item 4.2 (below), human activities that adversely affect biodiversity values on the Biodiversity Offset Area, including repeated disturbance of native animals, must not be carried out, or caused or permitted to be carried out, on the Biodiversity Offset Area.	Ongoing from commencement date.
4.2	Human activities that may have a negative impact on biodiversity values on the Biodiversity Offset Area are permitted if they are listed as permissible activities under clause 3.6 of this agreement or if they are undertaken as part of the management actions or management plans.	Ongoing from commencement date.
4.3	All waste shown on the map entitled insert exact name of existing waste map dated dd/mm/yyyy must be removed from the Biodiversity Offset Area in an appropriate manner. If there is no waste on the Biodiversity Offset Area delete the words of this item (but retain the numbering) and replace with: 'This item is not applicable.'	Commencing from ILMP / BOA PoM approval.
4.4	AZL must not store, dispose of, or cause or permit to be disposed of, any waste on the Biodiversity Offset Area. Note: The storage or disposal of waste on the Biodiversity Offset Area may require an approval under the *Protection of the Environment Operations Act* 1997.	Ongoing from commencement date.
4.5	AZL must take all reasonable steps to remove waste deposited by others on the Biodiversity Offset Area, or which is otherwise present on the Biodiversity Offset Area.	Ongoing from ILMP approval.
4.6	Fencing and/or signage must be installed and maintained to deter human disturbance including waste dumping. Signage must be the BioBanking signs available from the OEH. Specific requirements: Include clear description of where fencing or signage required including length of fencing and position of signage (e.g. access points). Refer to relevant map if necessary. Also include standard or type of fencing Signage should be located at points of access and other practical locations interfacing with adjoining properties. For Biodiversity Offset Areas that are located fully within a larger private landholding, there should be at least one BioBanking sign to be placed at the main access gate to the site. It is recommended that required signage be installed within 3 months of ILMP approval. .	Ongoing from ILMP approval.

Item 5	**Retention of regrowth and remnant native vegetation** Note: An approval under the *Native Vegetation Act 2003* is not required to carry out thinning or any other removal or damage to native vegetation under this item (Project Approved under Part 4.1).	**Timing**
5.1	Native vegetation (whether remnant native vegetation or regrowth) on the Biodiversity Offset Area must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except in accordance with item 5.2 below, or if it is required as part of the management actions or it is essential for the carrying out of permissible development under clause 3.5 of this agreement. Note: Native vegetation on the Biodiversity Offset Area may be managed to improve biodiversity values by thinning to benchmark stem densities over no more than 80% of each management zone. Benchmark stem densities has the same meaning as defined in the Vegetation Benchmark Database as published by OEH and updated from time to time. An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	Ongoing from commencement date.
5.2	Native vegetation on the Biodiversity Offset Area must not be burnt except in accordance with the fire management plan prepared pursuant to item 3 above.	Ongoing from commencement date.
Item 6	**Replanting or supplementary planting where natural regeneration will not be sufficient**	**Timing**
6.1	Planting is the BOA will not be necessary. Grassy Woodlands are the key outcome for the BOA. Natural regeneration is demonstrably very efficient across the BOA area under the current stocking regime's. By reducing grazing pressure there will be little to impede natural regeneration. White Box and White Cypress Pine is currently. If additional planting is required: AZL must undertake planting or seeding of the native groundcover/shrub/tree species indicated in the planting schedule for the Biodiversity Offset Area as set out in item 6.6 below (**'the planting schedule**') in the areas of planting and within the timeframe indicated in the planting schedule. If AZL cannot complete the planting within the timeframe indicated in the planting schedule due to local weather conditions, AZL must complete the planting as soon as possible after that date and must make a record of and retain the reasons why the planting was not completed by the required time. Appropriate site treatment (e.g. weed control) of each area of planting or seeding identified in the planting schedule must be undertaken prior to such planting. Specific requirements: x	Commencing from ILMP approval. .

	Include details regarding site treatment that must be undertaken before planting each area under the 'Specific requirements'. Planting or seeding is only required where natural regeneration is not sufficient to bring back native vegetation. Where no replanting is required, delete the words in every point of this item (but retain the numbering) and replace with: 'This item is not applicable.'	
6.2	Areas of planting or seeding as set out in the planting schedule must be protected from grazing for the first xx years after planting or seeding or until the plants exceed xx cm in height to ensure that the plants are established to such an extent that biodiversity values will be improved by such grazing and the plants will not be adversely impacted by grazing. Once that date or height has been met, grazing in the areas of planting or seeding must be managed in accordance with items 1.1, 1.2 and 1.4 of this Section 1. AZL must make a record of the date when the date or height requirement under this item is reached and the particular area of replanting in which it has been reached, and maintain that record in accordance with the record keeping requirements. Specific requirements: x If required, different years or heights for specific types of plants can be listed under 'Specific requirements'.	Ongoing from the completion of planting in each area of replanting.
6.3	AZL must survey each area of planting or seeding established under item 6.1 above and document them to determine whether the planted plants or seeds have established and survived, and retain the findings in accordance with the record keeping requirements. If, after the first survey or subsequent surveys, the establishment and survival rate of plants in an area of planting or seeding are below those usual for the species and region, AZL must supplement the planting in the adversely affected areas within a reasonable timeframe (usually within 12 months, though this can be varied and recorded in a diary with reasons for variation, if the weather is unsatisfactory for the establishment and survival of plants or seeds).	Conduct the first survey 24 months after the completion of planting or seeding in each area of planting or seeding, and then every 12 months thereafter.
6.4	Areas of planting and seeding must be managed as required to assist the establishment and survival of native plant species. Management includes watering, slashing, scalping, spraying of weeds, plant replacement and strategic grazing by stock (in accordance with item 6.2 above) at strategic times of the year to control weeds to improve biodiversity values. The dates of planting must be recorded in accordance with the record keeping requirements set out in Annexure D.	As required, from the date that planting or seeding areas are established.
6.5	Seeds and plants used for planting and seeding must be obtained from locally collected provenances, unless there are reasons to do otherwise (e.g. to ensure genetic variability or for adaptation to climate change).	As required (from commencement date if relevant to prepare for future planting).

The planting schedule should be filled in including:

- **number of plants per area** – for tubestock, the number of plants should be rounded to the nearest 100 if there are more than 1,000 plants or to the nearest 10 if there are 1,000 plants or less; if direct seeding is used leave this field blank
- **planting method** – specify whether plants are to be tubestock, direct seeding or another method
- **timing** – describe as the number of months (or Year if relevant (i.e. Year 1, Year 2, etc.)) for completion of planting from the ILMP approval. .

6.6 Planting schedule at the Biodiversity Offset Area

Species' common name	**Species' scientific name**	**Management zone/s of planting**	**Number of plants per area**	**Planting method**	**Timing** (months or Year)

Item 7	**Retention of dead timber**	**Timing**
7.1	Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the Biodiversity Offset Area except for the personal (non-commercial) use by AZL for firewood for one dwelling only or for repair of fencing (not for construction of fencing) or other permissible uses as detailed by AZL in the EA. Dead timber used for fencing repair must be documented by AZL in writing and records must be kept in accordance with the record keeping requirements. AZL must record the approximate amount of dead timber collected from the Biodiversity Offset Area for use in fencing, the location that that dead timber was collected from and the date it was collected (month, year). Specific requirements: x	Ongoing from commencement date.
7.2	Timber from outside the Biodiversity Offset Area may be introduced to and placed on the Biodiversity Offset Area to improve biodiversity values. Once the timber has been brought onto the site, it is subject to the requirements of item 7.1 above. Timber brought from outside the Biodiversity Offset Area must be documented by AZL in writing and records must be kept in accordance with the record keeping requirements. AZL must record the approximate amount of timber brought from outside the Biodiversity Offset Area, the location where the timber was placed on the Biodiversity Offset Area and the date on which it was placed (month, year). Specific requirements: x	When required but not required before the ILMP / BOA PoM approval.
Item 8	**Erosion control**	**Timing**
8.1	All reasonable steps must be undertaken to prevent, control and remedy erosion on the Biodiversity Offset Area. Soil management for preventing and controlling erosion is to be undertaken using best practice management, such as that developed by the Soil Conservation Service, applied as relevant for the Biodiversity Offset Area. AZL must manage existing erosion on the Biodiversity Offset Area, identified on the map entitled insert exact name of any erosion map or other relevant map dated dd/mm/yyyy, by conducting: • list activities. If there is no existing erosion, delete the last paragraph.	Commencing from ILMP / BOA PoM approval.

Item 9	Retention of rocks	Timing
9.1	AZL must not remove, or cause or permit to be removed, rocks from the Biodiversity Offset Area or move, or cause or permit to be moved, rocks within the Biodiversity Offset Area that is not consistent with the Pink-tailed Worm-Lizard Plan of Management.	Ongoing from commencement date.
9.2	Rocks from outside the site may be placed on the Biodiversity Offset Area to improve habitat for threatened species. Rocks, once placed on the Biodiversity Offset Area, are subject to item 9.1 above. AZL must make and retain records of the location of the rocks placed on the site and the date the rocks were brought onto the site in accordance with the record keeping requirements.	When required but not required before the ILMP / BOA PoM approval.

Section 2: Additional management actions

Additional management actions should only be completed when they are required for creating ecosystem credits or species credits. This will be stated on the Biobanking Agreement Credit Report.

Complete the required fields for any additional management actions required for your site. Leave all other additional management actions and OEH will delete them before including this section in your draft biobanking agreement.

Additional management actions		
Item 10	**Control of feral and overabundant native herbivores**	**Timing**
10.1	AZL must implement, and at all relevant times, comply with the management plan to control feral and overabundant native herbivores included in Section 4 (or such updated management plan as has been approved by the Determining Authority under item 10.2 below) ('**the feral and overabundant native herbivores management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the feral and overabundant native herbivores management plan, which must be recorded in writing in accordance with Section 3 of this Annexure. Note: A licence under Section 121 of the *National Parks and Wildlife Act 1974* may be required to control overabundant native herbivores.	Ongoing from ILMP approval.
10.2	The feral and overabundant native herbivores management plan must be reviewed at intervals of no less than 4 years and no more than 6 years. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Determining Authority in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Determining Authority within 3 months of commencing the review. Where the Determining Authority determines from the review that an update of the feral and overabundant native herbivores management plan is required, the Determining Authority will notify AZL in writing that an update of the plan is required and AZL must update the plan and submit the amended plan to the Determining Authority for approval within 3 months of receiving written notification from the Determining Authority that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Determining Authority in writing: • a description of the feral or overabundant native herbivore/s • consideration of relevant current OEH and other pest management	Ongoing from ILMP approval.

	programs and methods • the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management • the frequency and timing of the control actions in each management zone • methods for monitoring the success of the pest control actions • a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the Biodiversity Offset Area • additional control actions to destroy or remove any new feral and overabundant native herbivore pest species that occur on site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the feral and overabundant native herbivores management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
Item 11	**Vertebrate pest management – specify whether pigs, foxes, etc.**	**Timing**
11.1	AZL must implement, and at all relevant times, comply with the vertebrate pest management plan included in Section 4 (or such updated vertebrate pest management plan as has been approved by the Determining Authority under item 11.2 below) ('**the vertebrate pest management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the vertebrate pest management plan, but these must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from ILMP approval.
11.2	The vertebrate pest management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the review commencement must be provided to the Determining Authority in writing within 14 days of the commencement. The findings of the review must be submitted to the Determining Authority within 3 months of commencing the review. Where the Determining Authority determines from the review that an update of the plan is required, the Determining Authority will notify AZL in writing that an update of the plan is required. AZL must update the plan and submit it to the Determining Authority for approval within 3 months of receiving written notification from the Determining Authority that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Determining Authority in writing: • a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats • consideration of relevant current OEH and other pest management programs	Ongoing from ILMP approval.

	• the method/s of vertebrate pest control in each management zone determined in accordance with best management practice • the frequency and timing of vertebrate pest control actions in each management zone • methods for monitoring the success of vertebrate pest control actions • a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the Biodiversity Offset Area • additional vertebrate pest control actions to destroy or remove any new vertebrate pest species that occur on-site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary.	
Item 12	**Nutrient control**	**Timing**
12.1	Fertilisers, pesticides and herbicides must not be applied on the Biodiversity Offset Area, except where required to undertake the management actions. Use of fertilisers for establishing native vegetation through planting or seeding, use of herbicides for controlling weeds or use of pesticides for controlling vertebrate pests or feral herbivores can be undertaken in accordance with best practice management when required to undertake the management actions.	Ongoing from commencement date.
Item 13	**Control of exotic fish species**	**Timing**
13.1	Appropriate management actions must be conducted to suppress or control non-native fish species specify which non-native fish in waterways and water bodies specify which waterways and water bodies on the Biodiversity Offset Area in accordance with best practice management. Specific requirements: x	Ongoing from ILMP approval.
Item 14	**Maintenance or reintroduction of natural flow regimes**	**Timing**
14.1	Retained dams play a role in ecosystem function and some dams will be needed to be pumped to stock troughs outside of the BOA. Any surplus artificial structures on waterways or waterbodies on the Biodiversity Offset Area identified in the map entitled insert exact name of any existing structures map or other relevant map dated dd/mm/yyyy	Commencing from ILMP / BOA PoM approval.

	identified as requiring filling or removal in order to restore the natural flows will be removed or filled. All management actions associated with this item must be conducted in accordance with best practice management practice at the time. Specific requirements: x	
14.2	All necessary rehabilitation resulting from the removal of artificial structure/s referred to in item 14.1 must be undertaken. All management actions associated with this item must be conducted in accordance with best practice management. Specific requirements: x	Within xx months of the date an artificial structure is removed.
14.3	Artificial structures such as dams or levee banks that impede the natural flow regimes on the Biodiversity Offset Area must not be constructed unless approved by the Determining Authority in writing for the purpose of restoring natural flows.	Ongoing from commencement date.

Section 3: Standard management plans

Completing the compulsory weed management plan

A table is provided below for the integrated weed management plan. Add additional sections to the table if required.

The plan must include, but is not limited to:

- a description of the target weed/s at the Biodiversity Offset Area and their location/s, linked to each management zone where weeds are present
- the method/s of weed control in each management zone
- the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species
- the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities
- methods for monitoring weed control activities
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*)
- a diary for recording actions taken in accordance with the integrated weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 2.2), weed control activities may be amended, deleted or added to take into account the weed species on the site at that time.

Weed management plan

The weed types, description and location (management zone/s) of weed infestations existing at the commencement date are listed in the weed management plan. The methods of weed control (management actions), monitoring and inspections are also listed.

AZL must perform the methods of weed control and other weed management activities and monitoring in the weed management plan by the methods described (and in accordance with item 2 of this Annexure) for all weeds. The methods of control will apply to the weeds listed in the table below as well as any other weeds that may be present on the site from time to time.

The template for reporting of monitoring activities and the diary template for weed control management must be filled in to record observations during the implementation of the weed management plan, including any minor variations.

Weed types

Weed	Common name of target weed	Scientific name of target weed	Description of infestation (e.g. intensity (% cover) & location within zone)	Management zone/s
A				
B				
C				
D				
E				

Methods of weed control

Management zone/s	Weed/s	Method of weed control	Frequency (months or Year)

Native planting required to provide habitat for native species affected by weed control activities

Management zone	Description of planting required (reference planting schedule at item 6.6)	Timing

Monitoring and inspections of existing and new weeds

Management zone/s	Weed/s	Method of monitoring	Date/s required

Other weed management activities (where required)

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring** This table must include the information for each zone (or groups of zones) which is described in the table titled 'monitoring and inspections of existing and new weeds'.

Diary template for weed control management			
Date	**Management zone/s**	**Description and type of activity undertaken** (e.g. weed control, observation)	**Minor variations** (details and reasons)

Completing the compulsory fire for conservation management plan

A table is provided below for the fire conservation management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a map of the vegetation on the Biodiversity Offset Area (with date) and any infrastructure and built assets on the Biodiversity Offset Area (the map to be included in the biobanking agreement)
- the year the last fire went through, the type of fire and the extent of the fire and location, where known
- frequency of natural fires in the area of the Biodiversity Offset Area, where known
- a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt
- the methods that will be used for ecological burns
- the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for ecological burns
- methods for monitoring the outcomes of ecological burns
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the fire management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary in accordance with the record keeping requirements.

Fire for conservation management plan

The plan includes information on all known previous fire events in the 'Fire history' table to demonstrate local fire conditions including intensity and frequency.

The ecological fire requirements for each vegetation type or threatened species on the Biodiversity Offset Area are listed in the 'Fire requirements for vegetation types and threatened species' table. These are the fire frequency intervals recommended for the vegetation types and threatened species present on the Biodiversity Offset Area. They include any requirement adjustments to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act (RFA) 1997* to ensure the minimum frequencies between ecological burns.

AZL must carry out ecological burns for each management zone according to the method and frequency described (as informed by the history and requirements sections and in accordance with Section 3 of this annexure). These actions are set out in the 'Ecological burning actions table'. Monitoring and inspections (set out in the 'Fire management monitoring' table) as described must also be implemented. AZL must also carry out the actions listed in the 'Other fire management activities' table.

The table titled 'Template of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. AZL must also complete the table titled 'Diary template for fire management activities' to record the management actions undertaken or observations made, including any minor variations.

Fire history for previous 20 years (or longer if known)

Year of fire	Hazard reduction, wildfire or ecological burn and extent of fire	Management zone/s

Fire requirements for vegetation types and threatened species

Vegetation type and/or threatened species	Fire frequency required	Time of year for burning	Fire intensity required	Adjustment required due to wildfires or RFA activities

Ecological burning actions

Management zone/s	Actions	Supervision & extinguishing techniques	Time of year for burning	Frequency (years)

Methods for monitoring the outcomes of ecological burns

Management zone/s	Method of monitoring	Date/s required

Other fire management activities (where required)

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring**

Diary template for fire management activities			
Date	**Management zone/s**	**Description of activity undertaken or observation made**	**Minor variations** (details and reasons)

Section 4: Additional management plans

If required, complete this control of feral and overabundant native herbivores management plan

A table is provided below for the management plan to control feral and overabundant native herbivores. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the feral or overabundant native herbivore/s
- consideration of relevant current OEH and other pest management programs and methods
- the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management
- the frequency and timing of the control actions in each management zone
- methods for monitoring the success of the pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the Biodiversity Offset Area
- a diary for recording actions taken in accordance with the management plan to control feral and overabundant native herbivores and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 10.2 in Section 1), control activities may be amended, deleted or added to take into account the feral and overabundant native herbivore on the site at the time.

Management plan to control feral and overabundant native herbivores

The management plan for feral and overabundant native herbivores includes information on the management requirements for the feral and overabundant native herbivores at the Biodiversity Offset Area listed in the 'Feral and overabundant native herbivores' table. The possible methods of control for each species, used by OEH and other pest management programs, are listed and the suitability of each method is described in the 'Methods considered' table.

AZL must carry out the methods for control for feral and overabundant native herbivores for each management zone according to the method and frequency as described in the 'Methods for control' table. The methods of control applied to the feral or overabundant native herbivores listed in the 'Feral or overabundant native herbivores' table as well as any other feral or overabundant herbivores that may be present on the site from time to time.

Monitoring and inspections of existing and new feral and overabundant herbivores at the Biodiversity Offset Area as described in the 'Monitoring and inspections' table must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of the monitoring activities. The landowners must complete the table titled 'Diary template for feral and overabundant herbivore management' to record the management actions undertaken including any minor variations or observations made.

Feral and overabundant native herbivores

Feral type	Name of feral/overabundant native herbivore	Description of extent	Management zone/s
A			
B			
C			
D			
E			

Methods considered

Feral type	Name and description of program or method	Describe suitability

Methods of control

Management zone/s	Feral type	Method of control	Frequency and timing

Monitoring and inspections

Management zone/s	Feral type/s	Method of monitoring	Date/s required

Other management activities (where required)

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for feral and overabundant herbivore management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the feral and overabundant herbivores targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

If required, complete this vertebrate pest management plan

A table is provided below for the vertebrate pest management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats
- consideration of relevant current OEH and other pest management programs
- the method/s of vertebrate pest control in each management zone determined in accordance with best management practice
- the frequency and timing of vertebrate pest control actions in each management zone
- methods for monitoring the success of vertebrate pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the Biodiversity Offset Area
- a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary in accordance with the requirements.

All pest species identified as requiring management on a Biodiversity Offset Area must be included in the vertebrate pest management plan.

Separate management plans can be developed for each pest species.

When the management plan is reviewed (see item 11.2 in Section 1), control activities may be amended, deleted or added to take into account vertebrate pest species found on the site at that time.

Vertebrate pest management plan

The management plan for vertebrate pests includes information on the vertebrate pests and their extent existing at the time of the agreement as listed in the 'Vertebrate pests' table. The possible methods of control for each species, used by OEH and other pest management programs are listed and the suitability of each method to the Biodiversity Offset Area is described in the 'Methods considered' table.

AZL must carry out the methods for vertebrate pest control for each management zone according to the method and frequency described in the 'Methods of control' table, The methods of control will apply to the vertebrate pests listed in the 'Vertebrate pests' table as well as any other vertebrate pests that may be present on the site from time to time.

Monitoring and inspections of existing and new vertebrate pests on the Biodiversity Offset Area, as described in the 'Monitoring and inspections' table, must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. AZL must also complete the 'Diary template for vertebrate pest management' to record the management actions undertaken, including any minor variations, and observations made.

Vertebrate pests

Pest	Name of vertebrate pest (e.g. pig, fox, goat, dog)	Description of extent	Management zone/s
A			
B			
C			
D			
E			

Methods considered

Pest type	Name and description of program or method	Describe suitability

Methods of control

Management zone/s	Pest type	Method of control	Frequency and timing

Monitoring and inspections of existing and new vertebrate pests

Management zone/s	Pest type/s	Method of monitoring	Date/s required

Other management activities (where required)

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation or threatened fauna species** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for vertebrate pest management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the vertebrate pests targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

Photo points

This section of the management actions template is not part of *Annexure C: Management actions* but is required for *Annexure D* of the biobanking agreement which requires information relating to the placement of photo points for monitoring purposes. Fill in the table below so that this information can be included in the appropriate format in the final agreement. A map of the photo point locations is also required to be submitted.

Photo points should be positioned in areas that are likely to show change over time. Some plot locations can be used as photo points but many plot locations (especially in vegetated areas already in very good condition) may not show any change over time. Locate photo points where there will be changes because of management actions such as areas currently in low to moderate condition, targeted for revegetation and/or intensive weed control.

Photos are required to be taken every 12 months at the same location, direction, height and time of day.

Annexure D: Monitoring, reporting and record keeping requirements

1 Monitoring requirements

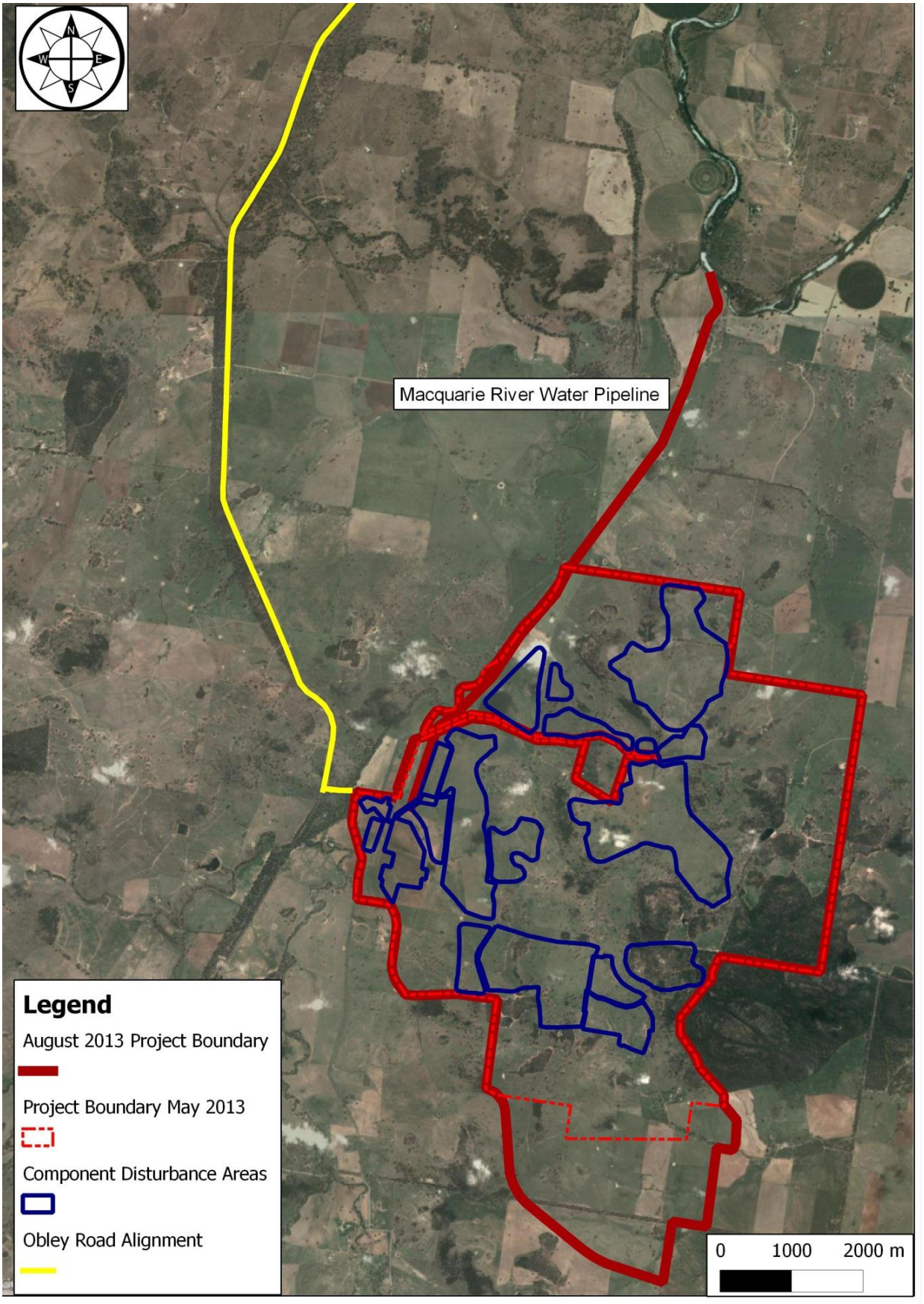
1.1 AZL must ensure that photographs are taken at photo-points at each of the locations and in the direction identified in the table below titled 'Locations of plots and photo points' within 12 months of the commencement date and then at least every 12 months thereafter.

1.2 The photo points are identified on the map entitled insert exact name of photo points map dated dd/mm/yyyy in Annexure A of this agreement. The purpose of the photographs is to show changes over time. Photographs should be taken at approximately the same direction, location, height and time of day (during daylight hours) in each reporting period (as defined in item 2.2 of this Annexure D) and retained for the life of this agreement. All photographs must be dated, stating the direction in which they were taken and identified with their locations.

Locations of photo points			
Projected coordinate system: specify			
Photo point reference	Easting	Northing	Direction of photo (magnetic degrees)

APPENDIX 18: AUGUST 2013 RE-ISSUED PROJECT AREA BOUNDARY – COMPARISON WITH ASSESSED AREA BOUNDARY (SUPPLANTED PROJECT AREA BOUNDARY)

This page has been intentionally left blank


N
W
E
S
Macquarie River Water Pipeline
Legend
August 2013 Project Boundary
Project Boundary May 2013
Component Disturbance Areas
Obley Road Alignment
0
1000
2000 m

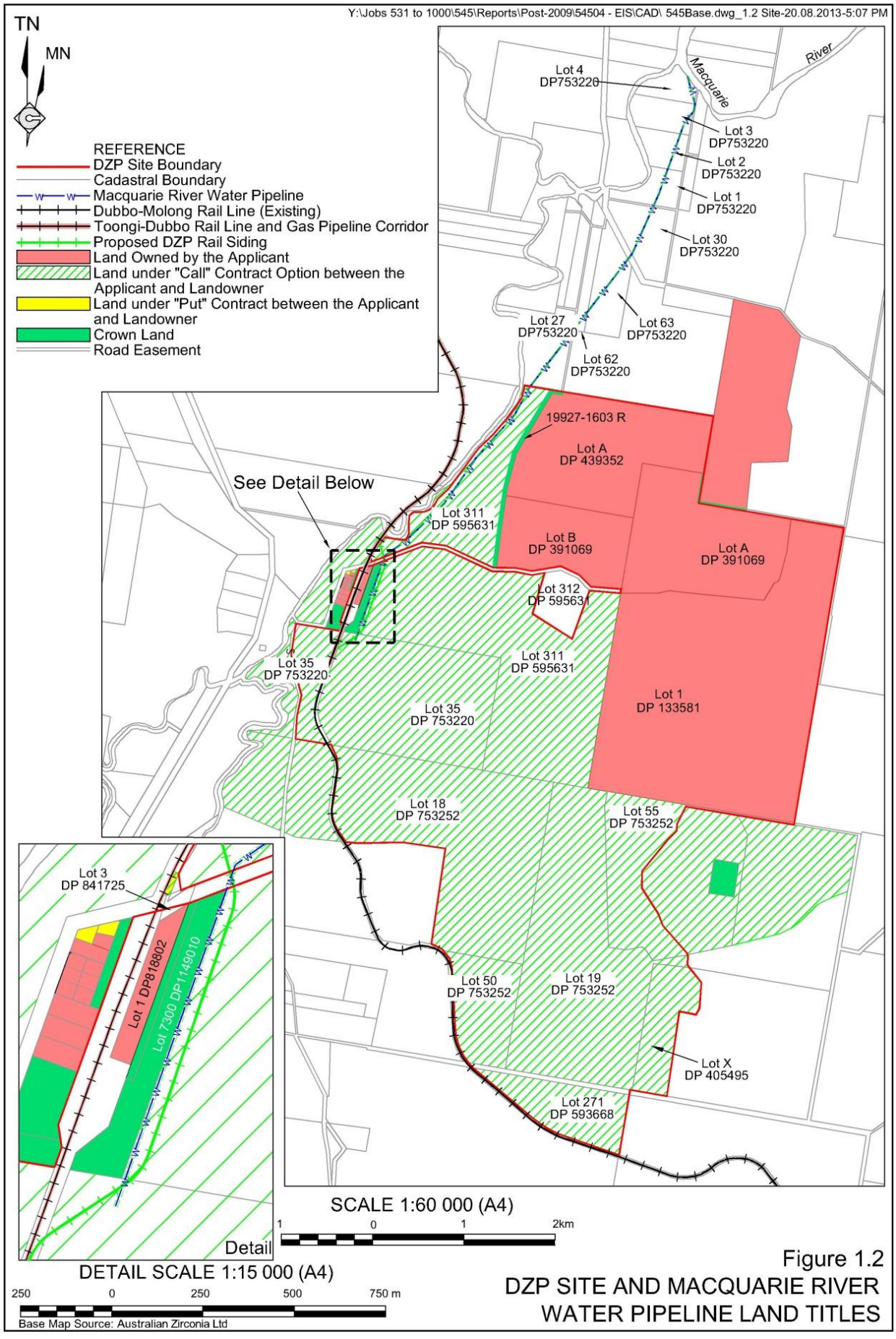


Figure 1.2
DZP SITE AND MACQUARIE RIVER WATER PIPELINE LAND TITLES