

Googong township water cycle project

Environmental assessment
Submissions report



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cic
AUSTRALIA

Manid's Roberts

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Executive summary

The Googong township water cycle project

The Googong township will be located south of Queanbeyan in NSW and is essential for meeting the growing housing and population needs of the Queanbeyan and Canberra region. With 5,550 dwellings, the township will provide 55 per cent of the 10,000 new dwellings required under the *Queanbeyan Residential and Economic Strategy 2031* and 22 per cent of those required under the *Sydney to Canberra Corridor Strategy 2031*.

The Googong township water cycle project (the Project) is an innovative water infrastructure scheme that will allow the 16,000 residents of the Googong township to use the same amount of drinking water that would traditionally sustain only about 6,000 people. The Project would deliver essential water and wastewater services needed for the township in a sustainable and best practice manner. Stage 1 of the Project would deliver these services to the first subdivision areas of the Googong township.

The key drivers of the Project are to:

- Provide the essential water and wastewater services to the Googong township.
- Achieve a substantial reduction in potable water demand in comparison to a traditional development.
- Be affordable, protect the Googong Dam and support the Googong township masterplan.

The Project comprises the following infrastructure:

- A water recycling plant.
- Reservoirs for recycled and potable water.
- Pumping stations for sewage, recycled water and potable water.
- Mains pipework (including rising and distribution mains) for sewage, recycled water and potable water throughout the township.

The proponent, CIC Australia (CIC) is seeking concept approval of the Project and project approval for Stage 1 of the Project from the former NSW Department of Planning (DoP), now the NSW Department of Planning and Infrastructure (DPI).

Consultation and public exhibition

Environmental assessment and consultation for the Project has been an ongoing process. In 2010, an environmental assessment (EA) was prepared under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This was based on almost a decade of planning, environmental assessment and design work.

In November 2010, the DPI placed the EA on public exhibition and called for submissions on the Project. The EA was available at the local library in Queanbeyan, at relevant NSW government offices, the NSW Nature Conservation Council and via the DPI website. The public exhibition period commenced on 17 November 2010 and submissions were due on 20 December 2010. During this time, CIC also undertook additional consultation with local stakeholders.

Submissions received

During and after following the public exhibition period, the DoP received a total of twelve (12) submissions. Four (4) were received from local residents, two (2) from ACT government agencies, five (5) from NSW government agencies and one (1) from Queanbeyan City Council. Government submissions were supportive or neutral regarding the project, while community submissions raised some concerns, including some that objected to aspects of the Project.

In summary, comments contained in submissions were:

- That more information should be provided regarding aquatic ecology and stormwater.
- That minor amendments or refinements should be made to the proposal to improve environmental outcomes and/or operational needs regarding the potable water supply.
- That further clarity regarding certain environmental or design aspects should be provided.
- That the riparian rights of users who extract water from the Queanbeyan River may be affected by the discharge of excess recycled water into the stormwater management system.

Several submissions also included comments that are related to the Googong township as a whole or were otherwise not relevant to the EA for the Project. This report has addressed the issues raised in the submissions that are related to the Project, as more general issues associated with other aspects of the Googong township are assessed elsewhere, such as within the previously approved rezoning (under the *Queanbeyan Local Environment Plan (Googong) 2009*), or the separate (and future) subdivision development applications (DAs) under Part 4 of the EP&A Act.

Response to submissions

This report responds to the submissions received by the DPI in relation to of the EA for the Project. It details that:

- All comments and issues contained within the submissions have been addressed with reference to previous assessments or to additional information – Sections 2 and 3, respectively.
- Refinements to the Project proposed in response to certain submissions would not materially change the predicted environmental impacts – Section 4.
- The draft statement of commitments provided in the EA that was placed on public exhibition is appropriate and required only minor amendment – Section 5.

Conclusion

The Project would provide the necessary water and wastewater infrastructure for the Googong township in a manner that is consistent with government and community expectations. The EA and this submissions report conclude that potential environmental impacts of the Project have been, and would continue to be, avoided, managed and mitigated during construction and operation.

CIC seeks approval from the NSW Planning Assessment Commission for the concept plan for the Project and the project application for Stage 1 of the Project.

1 Introduction

This chapter introduces this Submission Report. It provides a brief description of the Googong township, the need for the Project and the Project itself. It outlines the environmental assessment and approvals process and public consultation program undertaken by CIC.

The Googong township water cycle project (the Project) is an innovative water infrastructure scheme that will allow the 16,000 residents of the Googong township to use the same amount of drinking water that would traditionally sustain only about 6,000 people.

The NSW Department of Planning (now the Department of Planning and Infrastructure, DPI)¹ placed the environmental assessment (EA) for the Project on public exhibition from 17 November to 20 December 2010. During and after following the public exhibition period, the DPI received a total of twelve (12) submissions. Four (4) were received from local residents, two (2) from ACT government agencies, five (5) from NSW government agencies and one (1) from Queanbeyan City Council (QCC). Government submissions were supportive or neutral regarding the project, while community submissions raised some concerns, including some that objected to aspects of the Project.

This report responds to the submissions received from these stakeholders. It also describes the minor refinements that have been made to the Project, as a result of these submissions and further consultation undertaken with stakeholders.

This report has been prepared to satisfy the requirements of Section 75H of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and in accordance with the request by the DPI to prepare a submissions report, as contained within their correspondence dated 24 December 2010.

CIC Australia (CIC) is seeking approval for the Project under Part 3A of the EP&A Act.

It is anticipated that the NSW Planning Assessment Commission will determine the Project in June 2011.

1.1 Structure of this report

This submissions report is structured as follows:

- **Chapter 1** – provides an introduction to the project and the environmental assessment process, as well as a summary of the consultation undertaken to date.
- **Chapter 2** – responds to the submissions received by the DPI.
- **Chapter 3** – provides additional information regarding aquatic ecology and stormwater management, to further respond to key issues contained within certain submissions.

¹ Note, for simplicity, the former Department of Planning is referred to as the DPI throughout the rest of this document regardless of whether the actions referred to occurred before or after the change in the department's name.

- **Chapter 4** – describes the minor refinements made to the Project, as a result of the submissions and further consultation, and represents the preferred project report for the Project.
- **Chapter 5** – outlines the final Statement of Commitments (SoCs) for the Project.
- **Chapter 6** – conclusion.

1.2 The Googong township

The Googong township (to be developed by CIC Australia, www.cicaustralia.com.au) will be located in the Canberra region, seven (7) kilometres south of Queanbeyan in NSW. It has been designed to be one of the first purpose-built, large-scale water efficient communities in Australia, where the residents would use over 60% less water than those in a traditional development.

The Googong township will be home to about 16,000 people and will be developed over the next 25 years. The total area of the township is about 780ha, within which about 25 percent will be dedicated to public open space. Googong will include schools, commercial areas, retail, community facilities and a large recreational space in the centre of the township, known as the Googong Common.

Googong is essential for meeting the growing housing and population needs of the Queanbeyan and Canberra region. With 5,550 dwellings, the township will provide 55 percent of the 10,000 new dwellings required under the *Queanbeyan Residential and Economic Strategy 2031* and 22 percent of those required under the Sydney to Canberra Corridor Strategy 2031 (refer to Section 2.1 of the EA).

The land for the Googong township was rezoned for urban development by the NSW Government in December 2009, following almost eight years of specialist planning and assessment.

Further detail regarding the strategic context of the Project, including the *Sydney-Canberra Corridor Regional Strategy*, the *Queanbeyan Residential and Economic Strategy 2031* and the *Queanbeyan Local Environmental Plan (Googong) 2009* are provided in Chapter 2 of the EA and also on the project website (www.googong.net).

1.3 Need for the Project

The Googong township water cycle project (the Project) is required to provide the essential water and wastewater services. Further, the township was required by the NSW Government to meet best practice water conservation outcomes, which lead to the specific design of the water cycle system and infrastructure that comprises the Project, as described in the EA.

The scale of the Googong township requires a modern water and wastewater system to service residents. These services are essential to urban development and to ensure that relevant environmental and human health standards are achieved. The existing wastewater treatment facilities in the region are some decades old, remote from the site and do not have the capacity for the additional 16,000 residents, nor was it considered that upgrading the existing local facilities would produce a suitable environmental or human health outcome. Therefore, a new wastewater treatment facility was required for Googong.

As part of the rezoning of the land, Googong is required to meet objectives for potable water conservation. To achieve this, several options were explored. The conclusion was that an integrated water cycle system was required, including upgrading the proposed wastewater treatment facility to a water recycling plant (WRP) to provide recycled water within the township for non-potable purposes.

The Project, as summarised below, meets the combined needs of providing essential water and wastewater services, and achieving the required reduction in potable water use.

1.4 Project description

The Project would provide all necessary infrastructure to deliver potable water to a distribution system together with a sewage collection network to transfer waste flows to a WRP. The recycled water system would store recycled water and allow for reuse for non-potable purposes. The recycled water system would be supplemented by collected rainwater at households and, when necessary, potable water. Figure 1 outlines how the Project would integrate with the development of the township and the stormwater management system.

The Project comprises the following infrastructure:

- A WRP.
- Reservoirs for recycled and potable water.
- Pumping stations for sewage, recycled water and potable water.
- Mains pipework (including rising and distribution mains) for sewage, recycled water and potable water throughout the township.
- Connection to the stormwater management system.

Detailed information about the Project is provided in Chapter 5 of the EA.

1.5 Environmental assessment and planning approvals process

1.5.1 Application of Part 3A

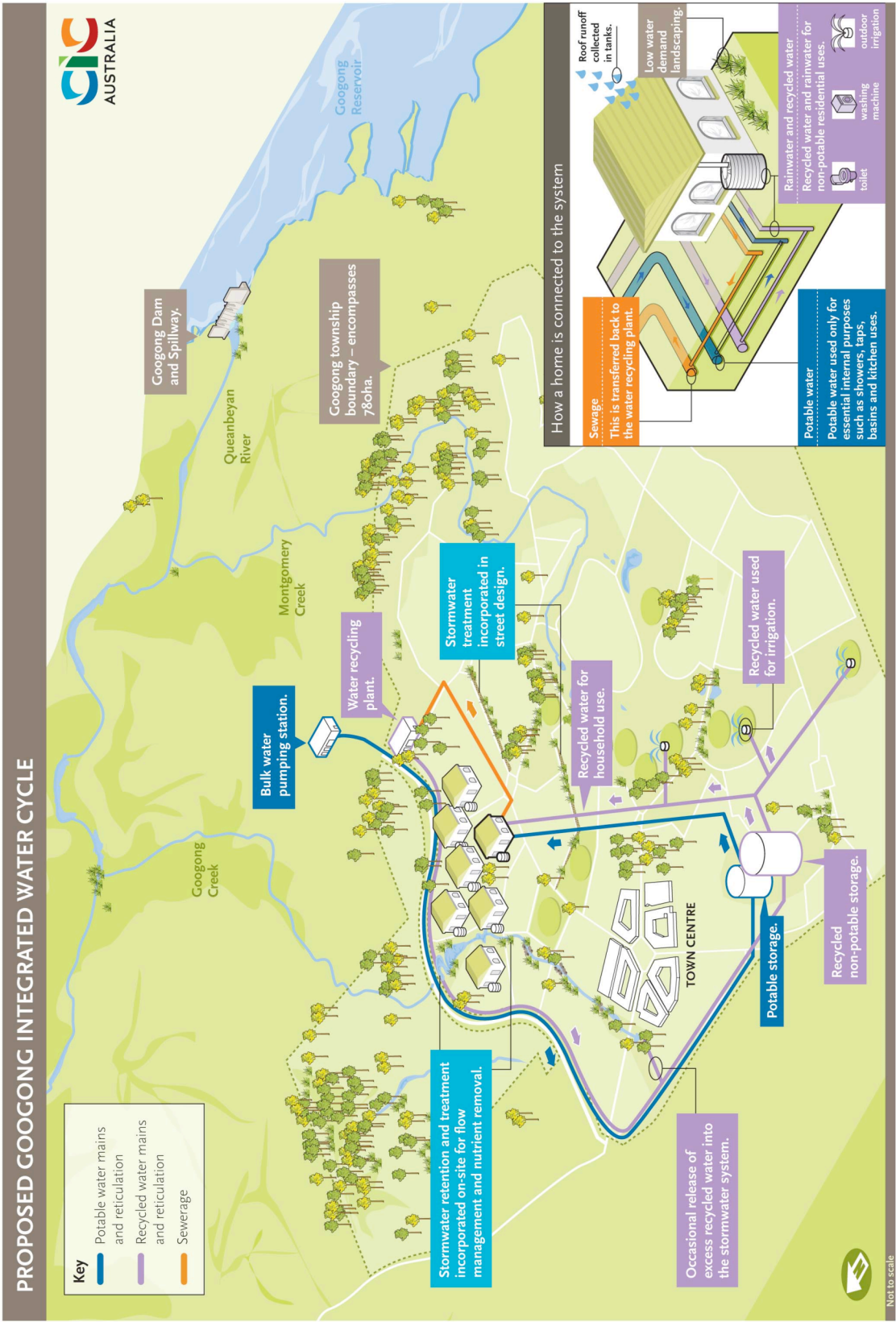
The project is considered a major project in accordance with the requirements of the *State Environmental Planning Policy (Major Projects) 2005*, and therefore follows the assessment and approval regime of a Part 3A project.

CIC, the proponent, submitted a major project application accompanied by a preliminary environmental assessment (PEA) to the DPI on 13 November 2008 and a request to the Minister for Planning for authorisation to prepare a:

- Concept plan for a Project – the Project being the development of the water cycle infrastructure for Googong township.
- Project plan to carry out part of that Project – that is, the water cycle infrastructure required for the first neighbourhood (neighbourhood 1A, approximately 1,200 dwellings) of the Googong township development.

These approvals are being sought concurrently.

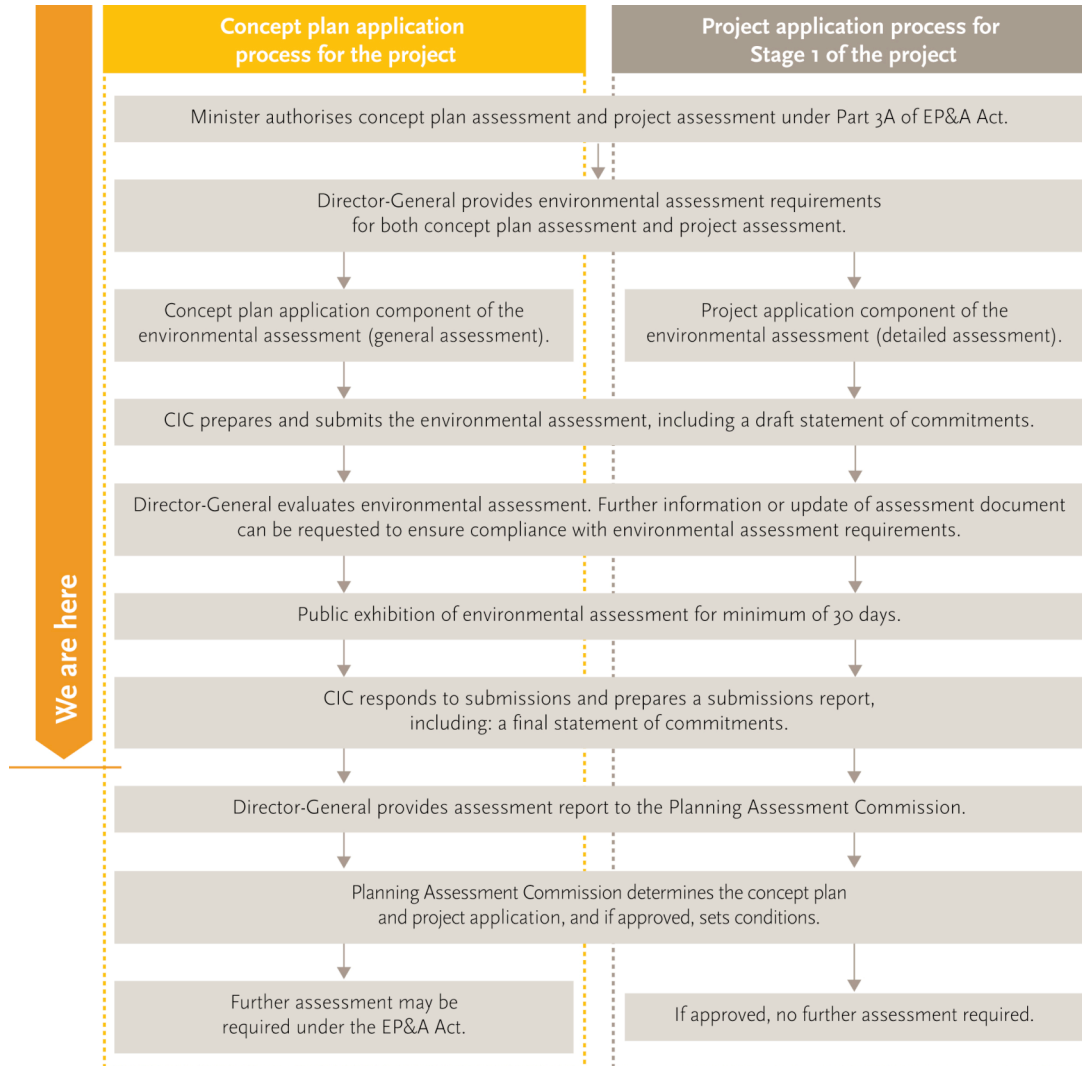
Figure 1 Key elements of the Project



1.5.2 Part 3A Approvals process

The process for concept plan and project approvals is provided in Figure 2. This process has been confirmed with the DPI following the recent change of government in NSW and the likely changes to the operation of Part 3A of the EP&A Act. As shown in Figure 2, the NSW Planning Assessment Commission will determine both the concept plan application and project application.

Figure 2 Concept and project application process



1.5.3 Activities following Part 3A determination

If the Project is approved, a range of activities would occur following the determination, including:

- Notification of the approval on the DPI website, Googong website and letters to individual stakeholders.
- Ongoing project development, including detailed design, safety studies, and development of the Construction environmental management plan (CEMP).
- Ongoing consultation with stakeholders and the provision of information to affected individuals and other stakeholders.

- Establishment of a monitoring station at the confluence of Googong Creek and the Queanbeyan River, and monitoring of water quality and flow data.
- Further groundwater assessment and other assessments/activities noted in the Statement of Commitments (Chapter 5).
- Construction of the water cycle infrastructure.
- Construction-related communications and stakeholder engagement.
- Development of the Operational environmental management plan (OEMP) and the environment protection licence for the WRP.

1.5.4 Part 4 approvals process

The Googong township, and its infrastructure components that are not being assessed under Part 3A of the EP&A Act, are assessed under Part 4 of the EP&A Act. The following components are currently being assessed under Part 4 of the EP&A Act or will be assessed under Part 4 in the future:

- The subdivision stages (within the neighbourhood areas) of the township.
- Water-related reticulation (ie the sewerage, potable and recycled water pipework).
- Stormwater and irrigation infrastructure.
- Open space.
- Other services and utilities for the township (ie roads, civil works, communications, gas, electricity, etc).

A development application (DA) has been submitted by CIC to QCC for Stages 1 and 2 (337 lots) of the first neighbourhood to be developed (Neighbourhood 1A, approximately 1,200 lots).

Sections 1.7.2 and 1.7.3 and Figure 1.5 of the EA provide a detailed description of the individual components of the infrastructure to be assessed under both Part 3A and Part 4 of the EP&A Act.

1.6 The public consultation program

1.6.1 Consultation prior to public exhibition

Consultation for the township has been ongoing for almost a decade. The stakeholder consultation process for the Part 3A assessment and approvals process commenced in May 2007. The program of consultation activities and outcomes of stakeholder engagement up until the finalisation of the EA are documented in Chapter 16 of the EA.

1.6.2 Consultation during the public exhibition

Public notification

The DPI advertised the EA exhibition in the Queanbeyan Chronicle and the Canberra Times on 16 November 2010. The Chronicle is distributed to the immediate local area and the Times is available in the entire ACT and the south-east NSW region. This allowed both local and regional members of the public to be informed of the exhibition locations and website details.

Exhibition locations

Complete hard copies of the EA were exhibited and available for public viewing in four locations from 17 November 2010 to 20 December 2010. Two locations were in the Queanbeyan area, including the local library and the NSW government offices. The other two locations were in Sydney, which were the DPI information centre and the NSW Nature Conservation Council office.

On 1 December 2010, the hard copy version of the EA that was provided to the Queanbeyan Library was removed by an unknown person(s). CIC provided a replacement copy within two (2) days to ensure that other members of the public could continue to view the document at the advertised location.

Department of Planning and Infrastructure website

The complete environmental assessment was available for download throughout the exhibition period from the DPI website at www.majorprojects.planning.nsw.gov.au.

Submissions and other project documentation are also available via the website.

Government agencies

As part of the exhibition process, DPI sent copies of the EA to several government agencies for their information and invited them to comment on the Project. Copies of the EA were sent to:

- The former NSW Department of Planning (Heritage Branch) – Sydney (now part of the NSW Office of Environment and Heritage, OEH).
- The DPI (Regional Office) – Queanbeyan.
- The former NSW Department of Environment, Climate Change and Water (DECCW, now the OEH) – Queanbeyan.
- NSW Office of Water (NOW, formerly part of DECCW) – Dubbo.
- The former NSW Roads and Traffic Authority – Wollongong (now the NSW Transport – Roads and Traffic Authority, RTA).
- NSW Health (Greater Southern Area Health Service) – Queanbeyan.
- The former NSW Department of Industry and Investment – Nelson Bay (now the NSW Department of Trade and Investment, Regional Infrastructure and Services – DTIRIS).
- QCC.
- Palerang Council.
- ActewAGL – Canberra.
- ACT Department of Environment, Climate Change, Energy and Water (DECCEW) – Canberra.

Of the above listed Government agencies, submissions were received from all, except Palerang Council.

State and federal parliamentarians

CIC contacted the offices of the (then) NSW and Commonwealth local members of parliament (Steve Whan and Mike Kelly, respectively) to offer a briefing regarding the project. Neither office took up the offer of a briefing.

Meeting with Queanbeyan City Council representatives

A meeting was held on 30 November 2010 with the Mayor of Queanbeyan, certain Councillors and Council officers. This meeting included a detailed presentation of the technical aspects of the Project and provided an opportunity for the Council representatives to ask the project team questions about the Project and the planning process.

Meeting with residents of Wickerslack Lane, Queanbeyan

A two-hour meeting was held on 13 December 2010 with about 10 residents of Wickerslack Lane, Queanbeyan, which is located north of the Googong township. This meeting was offered to these residents, as they have been involved in earlier consultation and had previously expressed an interest in being updated on the Project. This meeting included a presentation from the project team and a question-and-answer information session.

Summary paper and frequently asked questions paper

CIC prepared a short article regarding the public exhibition, which was placed on the news page of the Googong township website (www.googong.net/news.html). This was accompanied by a summary paper and answers to frequently asked questions about the Project. These two papers were also provided at the meeting with QCC representatives and Wickerslack Lane residents.

Telephone and email

Email addresses and telephone numbers were provided on the Googong township website and directly to attendees at meetings, so that the project team could be contacted to clarify any points or answer any questions regarding the project. During the exhibition period, only one phone call and no emails were received.

1.6.3 Consultation during preparation of the submissions report

Following the receipt of submissions, consultation with government agencies has continued in parallel with the preparation of this Submission Report.

Both the OEH and NOW were consulted during the preparation of this Submissions Report due to the refinements made to the project.

The information presented in the OEH submission (dated 21 December 2010) was discussed with Julian Thompson on several occasions, including the additional information to be provided in this report. A meeting was offered to OEH to discuss any issues, but they considered that a meeting was not required. The outcomes of this consultation, such as the changes to Statement of Commitments H1 and H2 in relation to Aboriginal heritage, have been included in this report (Section 5.1). Section 4.3 of this report details that the identification of two feasible options to meet the discharge requirements of the OEH would be undertaken during the detailed design of the bulk water pumping station.

Discussions were held with NOW regarding the information presented in their submission (dated 6 January 2011). The outcomes of this consultation resulted in the addition of a new commitment, the Statement of Commitment G8 (Section 5.2 of this report). This statement of commitment addresses the timing of the groundwater assessment as part of an overall program of further monitoring and assessment in terms of the staging of construction

Both OEH and NOW have stated that they would like to receive a copy of the final Submissions report and one will be submitted to them after finalisation.

Ongoing liaison with DPI regarding the preparation of this report has also been undertaken.

1.6.4 Ongoing and post-exhibition consultation

Stakeholder engagement will continue following approval of the Project.

Ongoing consultation with government agencies, statutory bodies, Aboriginal stakeholders, local councils, utilities and other identified stakeholders will continue to form a key part of project delivery during the approval process through to construction and operation.

Googong township-foreshores interface working group

As part of the EPBC referral for the township, a Googong foreshores-township interface working group was formed in mid-2010 to undertake alignment between the commitments that were being proposed in the various planning approval documents and the Googong Foreshores Plan of Management. Parties represented on the working group are:

- CIC Australia.
- Commonwealth Department of Finance and Deregulation.
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formerly the Department of Water, Heritage and the Arts).
- ACT Territory and Municipal Services.
- ACTEW Corporation/ActewAGL.
- QCC.

2 Submissions

This chapter contains an analysis of the submissions received during the public exhibition of the Googong township water cycle project environmental assessment:

- Section 2.1 contains a summary of the submissions received.
- Section 2.2 discusses the submissions in relation to the scope of the Part 3A environmental assessment.
- Section 2.3 contains responses to submissions from government agencies. It references the relevant Statement of Commitment and whether or not it has been amended, or where the comment is addressed in the EA or this report.
- Section 2.4 contains comments raised by stakeholders other than government agencies. It also references where the comment is addressed in the EA or this report.

2.1 Submissions received

A total of twelve (12) submissions were received. Four (4) were received from local residents, two (2) from ACT government agencies, five (5) from NSW government agencies and one (1) from QCC. Government submissions were supportive or neutral regarding the project, while community submissions raised some concerns, including some that objected to aspects of the Project.

Seven (7) submissions were received by the due date (20 December 2010), with three (3) received by DPI between 21 December 2010 and 6 January 2011. An additional two (2) submissions were received in early April 2011.

In addition to the submissions, the Major Projects and Heritage branches of the DPI (the Heritage Branch is now within the NSW Office of Environment and Heritage – OEH) sought clarification of certain aspects of the EA. As requested by DPI, separate responses to those queries have been prepared and were submitted to DPI on 29 March 2011 and 27 April 2011, respectively.

Table 1 below, summarises the submissions received by the DPI and the full submissions are provided in Appendix E.

Table 1 Summary of the submissions received

Number	Organisation/stakeholder	Date received by DPI	Key issues raised in the submission
1	NSW Transport – Roads and Traffic Authority (the former NSW Roads and Traffic Authority)	9/12/2010	No issues were raised.
2	Greater Southern Area Health Service (NSW Health)	13/12/2010	<ul style="list-style-type: none">• Adherence to guidelines for drinking and recycled water.• Emergency management planning.

Number	Organisation/stakeholder	Date received by DPI	Key issues raised in the submission
3	NSW Department of Trade and investment, Regional Infrastructure and Services (formerly the NSW Department of Industry and Investment)	17/12/2010	<ul style="list-style-type: none"> Management of waterways and aquatic ecology.
4	ACT Department of Environment, Climate Change, Energy and Water (DECCEW)	17/12/2010	<ul style="list-style-type: none"> Protection of the Pink-tailed Worm Lizard and its habitat.
5	Wickerslack Lane Resident #1	20/12/2010	<ul style="list-style-type: none"> Level of assessment of geology and geomorphology. Level of information provided regarding, aquatic ecology, surface and groundwater quality.
6	Wickerslack Lane Resident #2	20/12/2010	<ul style="list-style-type: none"> Level of information, clarity and reliability of data and monitoring of aquatic ecology. Water quality in the Queanbeyan River. Role of QCC in management of the WRP. Emergency management planning.
7	ActewAGL	20/12/2010	<ul style="list-style-type: none"> Clarification of the (revised) bulk water pumping station location.
8	NSW Office of Environment and Heritage (formerly the Department of Environment, Climate Change and Water – DECCW)	21/12/2010	<ul style="list-style-type: none"> Water quality regarding the discharge of excess recycled water. Protection of the Pink-tailed worm lizard, and its habitat. Protection of Aboriginal cultural heritage site(s).
9	Queanbeyan City Council	23/12/2010	<ul style="list-style-type: none"> Details of the construction and operation of water cycle infrastructure. Construction and operation environmental management planning. Adherence to relevant guidelines.
10	NSW Office of Water (formerly part of DECCW)	6/1/2011	<ul style="list-style-type: none"> Level of assessment of the ecological impacts of changes to flow regimes. Identification and assessment of impacts to downstream water users. Changes in the recharge regime and groundwater levels.
11	Wickerslack Lane Resident #3	1/4/2011	<ul style="list-style-type: none"> Water quality of the excess recycled water. Water quality in the Queanbeyan River. Emergency management planning.
12	Wickerslack Lane Resident #4	4/4/2011	<ul style="list-style-type: none"> Water quality in the Queanbeyan River. Emergency management planning. Stormwater management. Ecology and sediments in Googong Creek.

2.2 Scope of the Part 3A environmental assessment

Many of the submissions received provide general recommendations or comments that are not (wholly or partially) related to the scope of the Part 3A environmental assessment (EA). It is important to revisit the scope of the environmental assessment to provide context for the responses to the submissions presented in the remainder of this chapter. In particular, the EA must be considered within the context of the urban (residential) zoning that now applies to the majority of the Googong township site, which was approved by the NSW Government in their rezoning of the land in December 2009.

The Part 3A EA relates solely to the water cycle infrastructure that forms the Googong township water cycle project, which includes:

- A WRP.
- Reservoirs for recycled and potable water.
- Pumping stations for sewage, recycled water and potable water.
- Mains pipework (including rising and distribution mains) for sewage, recycled water and potable water throughout the township.
- Connection to the stormwater management system.

Examples of comments contained within the submissions received that are outside the scope of the EA are:

- Aspects of the stormwater management system that are not related to the discharge of excess recycled water into the stormwater system. These will be assessed separately under Part 4 of the EP&A Act.
- Aspects of the Googong township that are not related to water cycle infrastructure, such as roads and the subdivision of land. These will be assessed separately under Part 4 of the EP&A Act.
- Management of the Queanbeyan River catchment outside of the Googong township. The proponent is only able to directly manage the development of Googong township (assessed under Part 4 of the EP&A Act) and the associated water cycle infrastructure (the Project being assessed under Part 3A of the EP&A Act), as well as any downstream environmental impacts. The studies undertaken as part of the EA have assessed the impacts of the Project on the Queanbeyan River catchment and measures to mitigate the predicted impacts will be implemented.
- Commercial aspects related to the likely transfer of ownership of water cycle infrastructure to QCC. These are part of ongoing negotiations between CIC Australia and QCC, regarding the Voluntary Planning Agreement for Googong.

The following Sections (Sections 2.3, 2.4 and 2.5 of this report) provide responses to the submissions received by the DPI from agencies and the community, respectively. Each comment related to the scope of the EA is summarised and noted with a unique identification number. A response to each comment is then provided, with reference to where further information can be obtained from the EA or other sections of this report. The final column of each table provides a guide for cross-referencing between the relevant documents.

2.3 Response to agency submissions

Table 2 Response to agency submissions received by DPI

ID	Comment	Response	Reference
NSW Transport – Roads and Traffic Authority (former NSW Roads and Traffic Authority)			
1A	Consider any likely impacts to the natural or built environment in the road reserve fronting the proposed development. Consider traffic noise impacts on adjacent residences, impacts on indigenous or non-indigenous heritage items or threatened species.	<ul style="list-style-type: none"> As mentioned in the introduction, the EA only assesses the Googong Water Cycle Project, with the development of the Googong township being assessed under Part 4 of the EP&A Act. Section 1.5.4 of this report provides a description of the infrastructure components being assessed under Part 4 of the EP&A Act. Impacts of the development of the township on public amenity, heritage and threatened species have been assessed in documents supporting the development application (DA). QCC is currently assessing the DA submitted under Part 4 for Stages 1 and 2 (337 lots) of the first neighbourhood of the Googong township. The EA assesses all likely impacts of the water cycle infrastructure to the natural or built environment in the road reserve fronting the proposed Googong township. Statement of Commitments T1-T5 address management of traffic impacts for construction and operation. Statement of Commitments H1, H2 and NH1-NH3 address indigenous (Aboriginal) or non-indigenous heritage items. Statement of Commitment F2 addresses the protection of threatened species. 	<ul style="list-style-type: none"> Section 1.5.4 of this report. Statement of Commitments T1-T5. Statement of Commitments H1 and H2. Statement of Commitments NH1-NH3. Statement of Commitment F2.
Greater Southern Area Health Service (NSW Health)			
2A	Water provided as drinking water is to comply with the <i>Australian Drinking Water Guidelines 2004</i> . Ongoing management and monitoring of the supply is to form part of the <i>NSW Drinking Water Monitoring Program</i> .	<ul style="list-style-type: none"> Drinking water for the Googong township will be sourced from the existing water supply network, which supplies the Canberra and Queanbeyan areas. This water supply network is managed by the ACTEW Corporation and QCC, under a service level agreement between the two organisations, to ensure that the drinking water complies with the Australian Drinking Water Guidelines. As the agency responsible for potable (drinking) water supply, QCC would undertake ongoing management and monitoring of the supply, which will form part of the NSW Drinking Water Monitoring Program. It is noted that recycled water would only be used for non-potable uses throughout the Googong township. 	<ul style="list-style-type: none"> Section 5.3 of the EA.

ID	Comment	Response	Reference
2B	Consider the <i>Australian Guidelines for Water Recycling</i> and the <i>Interim NSW Guidelines for Management of Private Recycled Water Schemes 2008</i> .	<ul style="list-style-type: none"> Statement of Commitment HH1 states that recycled water produced by the WRP will meet all guidelines, particularly the requirements for unrestricted non-potable use as defined in the <i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks</i> and the requirements of the <i>Interim NSW Guidelines for Management of Private Recycled Water Schemes 2008</i>. The design and the operation of the water recycling infrastructure has been and will be undertaken in accordance with the <i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks</i>. These guidelines provide a 12-element framework for the management of human health and environmental risks. As part of the design of the WRP, two forms of disinfection of the recycled water will be undertaken to ensure the removal of human pathogens and to ensure the water is suitable for recycling and release to the environment (Sections 5.3.3, 5.3.4, 5.5.5, 8.2 and 8.3 of the EA). This guideline framework will be used in the development of the Recycled Water Risk Management Plan (RWRMP) and the implementation of risk management practices for the operation of the Project (refer to Sections 8.2 and 8.5 of the EA). The RWRMP will be prepared in consultation with the relevant government agencies (refer to Statement of Commitments HH1, HH2 and HH3). This national framework has also been adopted within a State (NSW) set of guidelines titled the <i>Interim NSW Guidelines for the Management of Private Recycled Water Schemes 2008</i>. These guidelines will also be followed in the development of the RWRMP for the operation of the Project (Section 8.3 of the EA). 	<ul style="list-style-type: none"> Sections 5.3.3, 5.3.4, 5.5.5, 8.2, 8.3 and 8.5 of the EA. Statement of Commitments HH1-HH3.

ID	Comment	Response	Reference
2C	Recommends that the stormwater management strategy considers the impact of WRP emergency overflows. It should consider both quantity and quality of recycled water being received into the stormwater system and subsequent impact on receiving watercourses.	<ul style="list-style-type: none"> The WRP has been designed to accommodate all wet weather sewage flows from the township. There is also the space allocated at the WRP site for a flow control facility to be constructed if required, to accommodate additional flows for a period of time before passing those additional flows through the plant for treatment. Section 5.3.3 of the EA provides a detailed description of the design of the WRP. Appendix D of this report provides a letter prepared by Brown Consulting (dated 13 April 2011), which provides further information on the modelling (hydrological, hydraulic and water quality) and analytical approach undertaken as part of the EA. The outcome of the assessment was that with or without recycled water flows, the stormwater quality leaving the Googong township site below the Googong Dam Road will meet all the applicable water quality targets. Further, the assessment concluded that emergency overflows from the WRP would not result in a detrimental impact to the receiving environment. Appendix M of the EA (Stormwater management and drainage analysis design report) includes the full report of the assessment undertaken by Brown Consulting during the preparation of the EA. In addition, the stormwater management system includes a drainage reserve immediately adjacent to the WRP, which would be designed with consideration of any emergency flows from the plant (refer to Section 5.3.3 of the EA and Appendix M of the EA). It is noted that the stormwater management system is primarily part of the subdivision design and is being assessed under Part 4 of the EP&A Act. 	<ul style="list-style-type: none"> Section 5.3.3 of the EA. Appendix D of this report. Appendix M of the EA.
2D	Open water bodies located within the development should receive consideration in relation to mosquito control and the incidence of algal blooms.	<ul style="list-style-type: none"> It is noted that this comment is generally related to the stormwater management system, which is generally assessed separately under Part 4 of the EP&A Act. To respond further, however, CIC will ensure that open water bodies within the development will be managed through the RWRMP, based on the risk management framework outlined in <i>Australian National Guidelines for Water Recycling – Managing Health and Environmental Risks</i> (2006). Importantly, the RWRMP will be developed through hazard identification, and identification of significant human and environmental risks, such as mosquito control and algal blooms. Refer to Statement of Commitment HH2. 	<ul style="list-style-type: none"> Statement of Commitment HH2.

ID	Comment	Response	Reference
2E	Appropriate management measures should be considered to address any negative impact of the increase in the population in the Googong area on the water catchment area, the foreshore environment and water quality of Googong Reservoir.	<ul style="list-style-type: none"> As shown on Figures 7.2 and 7.3 of the EA no components of the Project will be located in the hydrological catchment of Googong Reservoir. Therefore no direct impacts on the reservoir are predicted. The indirect impacts of increased patronage and use of the areas surrounding the Googong Reservoir has been assessed in the referral submitted to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) under the EPBC Act. The referral was submitted in February 2011. The trigger for the referral was that the land surrounding the Googong Foreshores is owned by the Commonwealth Department of Finance and Deregulation and assessment of impact is required under the EPBC Act for actions affecting this land. The referral concluded that the impact of the Project on Googong Reservoir and its catchment would not be significant. It is possible that the patronage of the northern Googong Foreshores area and facilities will significantly increase due to the increased local population. The potential impacts of increased patronage were assessed against the objectives detailed in the <i>Googong Foreshores Plan of Management 2010</i> (prepared by the ACT Department of Territory and Municipal Services). Activities that could impact on the achievement of the objectives include: <ul style="list-style-type: none"> Illegal use of motorised watercraft on the reservoir. Illegal use of the reservoir for swimming. Illegal intrusion of domestic pets. Illegal use of motorised vehicles, such as trail bikes, in prohibited off-road areas. 	<ul style="list-style-type: none"> Figures 7.2 and 7.3 of the EA.

ID	Comment	Response	Reference
		<ul style="list-style-type: none"> Several factors, however, suggest that the extent and nature of impact is likely to not be significant: <ul style="list-style-type: none"> The Googong development provides high levels of recreational self-containment by providing a rich array of open spaces (about 25 percent of the Googong township area) and facilities. For residents who choose to utilise the Googong Foreshores for recreation, it is the current role of the ACT Department of Territory and Municipal Services to provide the necessary supervision to mitigate any negative impacts as part of its land management function. Public access to the Googong Dam and Foreshores Area would continue to be managed through the access gate on Googong Dam Road and other existing access points, and a new fence would be constructed along the township-foreshores boundary. Education programs for Googong township residents will be developed to raise awareness of the water quality and environmental sensitivity of the Googong Foreshores area to foster a stewardship approach. As described in the referral, the proponent has committed to supporting the ongoing management of the foreshore area, including making a significant financial contribution to TAMS - ACT Parks, Conservation and Lands. 	
2F	Consider the emergency management procedures (ingress and egress, as well as points of evacuation) during construction and operation.	<ul style="list-style-type: none"> The Construction environmental management plan (CEMP), Operational environmental management plan (OEMP) and the Recycled water risk management plan (RWRMP) would outline the management of emergency situations for all key water cycle infrastructure. Refer to the Statement of Commitment R2 (Chapter 5 of this report). 	<ul style="list-style-type: none"> Statement of Commitment R2. Chapter 5 of this report.

ID	Comment	Response	Reference
NSW Department of Trade and Investment, Regional Infrastructure and Services (formerly the NSW Department of Industry and Investment)			
3A	Ensure that the development complies with the requirements of the <i>Fisheries Management Act 1994</i> and the associated Policy and Guidelines for <i>Aquatic Habitat Management and Fish Conservation</i> (1999).	<ul style="list-style-type: none"> Section 11.2.2 of the EA outlines the process undertaken to ensure that the NSW <i>Fisheries Management Act 1994</i> was complied with. NSW Fisheries (now part of the Department of Trade and Investment, Regional Infrastructure and Services) was consulted pursuant to Section 34A of the EP&A Act prior to preparation of the <i>Googong Local Environmental Study</i> (LES). They also provided comment on the draft EA in February 2010. The department has advised that the Queanbeyan River was once a known habitat for Macquarie Perch (<i>Macquaria australasica</i>), which is listed as a vulnerable species. NSW Fisheries (now part of the Department of Trade and Investment, Regional Infrastructure and Services) has advised that any draft local environmental plan prepared for the study area should make reference to the fact that Macquarie Perch were once known to live in the Queanbeyan River and that the precautionary principle should be adopted when preparing design requirements. 	<ul style="list-style-type: none"> Section 11.2.2 of the EA.
3B	Recommends that any proposed new or upgraded road crossings of Googong and Montgomery Creeks should be designed and constructed in accordance with the Department's <i>Policy and Guidelines for Fish Friendly Waterway Crossings</i> (2004) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (2004). The design of any road crossings of these waterways should be submitted to the Department of Trade and Investment, Regional Infrastructure and Services for approval prior to construction.	<ul style="list-style-type: none"> The only roads subject to Part 3A of the EP&A Act are the access roads required for the construction and operation of the infrastructure components of the Project (ie the WRP, pumping stations, pipelines and reservoirs as discussed in Section 5.5.3 of the EA). The location of these infrastructure components are shown in Figure 5.16 of the EA and for the bulk water pumping station in Figure 5 of this report. It is noted that these roads will not cross either Googong or Montgomery Creeks. All other roads are subject to assessment under Part 4 of the EP&A Act as part of the Googong township and subdivision components (Section 1.7.3 of the EA). CIC will design and construct any new road crossings of the Googong and Montgomery Creeks that are to be approved under Part 4 of the EP&A Act in accordance with the Department's <i>Policy and Guidelines for Fish Friendly Waterway Crossings</i> (2004) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (2004). CIC will also consult with the Department of Trade and Investment, Regional Infrastructure and Services regarding the design of any new road crossings of Googong and Montgomery Creeks prior to construction. 	<ul style="list-style-type: none"> Sections 1.7.3, 5.5.3 and Figure 5.16 of the EA. Figure 5 of this report.

ID	Comment	Response	Reference
3C	Recommends the development be reviewed against the NSW Department of Trade and Investment, Regional Infrastructure and Services Guideline <i>Infrastructure proposals on rural lands</i> .	<ul style="list-style-type: none"> The guideline was developed in October 2010. It provides guidance to consent authorities for use when assessing infrastructure proposals affecting rural resource lands. The guideline aims to maintain sustainable primary production and development opportunities and minimise land use conflict. The specific objectives of the guideline are listed below with an assessment of the Project against these objectives. To minimise impacts on agricultural resources from projects: <ul style="list-style-type: none"> The Project has been designed and assessed in accordance with the requirements of the DGR's and the requirements of the EP&A Act. The Project has also been justified in a local and regional context (in accordance with the <i>Sydney-Canberra Corridor Regional Strategy 2006-31</i> and the <i>Queanbeyan Residential and Economic Strategy 2031</i>) for suitability. Sections 2.1 – 2.3 of the EA provides further detail. The Project will not impact on agricultural lands as the land on which the Project is situated is zoned for general residential or infrastructure (Figure 2.2 of the EA). Sections 2.2 and 2.3 of the EA provide further detail. Where possible, Project infrastructure has been located within existing infrastructure corridors (ie road corridors) to minimise conflict with other current and future land uses. Section 4.2 of this report provides further details regarding the bulk water pumping station and associated infrastructure. To minimise resource losses and fragmentation and impacts on farm productivity and livestock: <ul style="list-style-type: none"> The Project will support the development of the Googong township as a residential area in accordance with the current land use zonings for the area (Figure 2.2 of the EA). As the components of the project are not located on agricultural land, it will not result in resource losses or fragmentation and impacts on farm productivity or livestock. To minimise biosecurity, pest and weed risks and impacts on livestock: <ul style="list-style-type: none"> The Project will not impact on any agricultural lands and will not increase biosecurity, pest or weed risks or have impacts on livestock. The management and control of weeds during construction activities will reduce weed impacts in the area. Weeds will be managed under the Flora and fauna management plan (required by Statement of Commitment F1). Section 11.1.4 details this requirement in the EA. 	<ul style="list-style-type: none"> Sections 2.1-2.3 and 11.1.4 and Figure 2.2 of the EA. Sections 1.6, 4.2 of this report. Statement of Commitments C1, CS1-CS3 and F1.

ID	Comment	Response	Reference
		<ul style="list-style-type: none"> To undertake rehabilitation activities in consultation with landholders and relevant agencies, where applicable: <ul style="list-style-type: none"> Rehabilitation activities will be undertaken for the Project and will be detailed in the Construction environmental management plan (CEMP) for the Project (required by Statement of Commitment C1). The CEMP will be prepared in consultation with the relevant agencies. To undertake consultation with relevant authorities on the design, construction and operation of a project: <ul style="list-style-type: none"> Consultation with relevant authorities has been undertaken as part of the development of the EA. Section 1.6 of this report provides further information. Consultation will continue to be undertaken, as required, throughout the Project stages and will be detailed in the consultation strategy to be prepared for the Project. Statement of Commitments CS1-CS3 details these commitments. 	
ACT Department of Environment, Climate Change, Energy and Water (DECCEW)			
4A	Notes that the Pink-tailed Worm Lizard is a declared species in the ACT and recommends that any regional impact on ACT populations should be considered. Recommends that clearance of habitat should be avoided and that the development should include consideration of cumulative impacts on the species.	<ul style="list-style-type: none"> The Pink-tailed Worm Lizard (<i>Aprasia parapuchella</i>) has been subject to further and more detailed ecological study (as part of the Googong township's EPBC referral documentation) since the EA has been placed on public exhibition. Biosis Research undertook the studies in late 2010. CIC Australia now proposes to dedicate an <i>Aprasia</i> Conservation Area of about 52ha to QCC (or another suitable land manager) and undertake regeneration works to provide for a positive conservation outcome for this species. This area is detailed in Section 4.4 and shown in Figure 6 of this report. It is noted that while the Project does not impact on any ACT land, the Pink-tailed Worm Lizard is a declared species in the ACT. The regional or cumulative impacts on the listed ACT populations of the Pink-tailed Worm Lizard and on the Hoary Sunray habitat were assessed in the flora and fauna assessment reports prepared by Ecowise Environmental and Biosis Research for the Project (Appendices F and P of the EA, respectively). As described in Section 11.1.6 of the EA, the reports conclude that the design of the Project has led to the avoidance of the habitat for the Pink-tailed Worm Lizard (and the Hoary Sunray) populations. Therefore, regional or cumulative impacts on the ACT populations of these species are not predicted. 	<ul style="list-style-type: none"> Section 4.4 and Figure 6 of this report. Section 11.1.6 of the EA Appendices F and P of the EA.

ID	Comment	Response	Reference
4B	Comments that older surveys have been used to determine vegetation data for the subject site. Resurveying the area now may provide different results as the vegetation may well be in better condition than previous, particularly if land use has changed.	<ul style="list-style-type: none"> Flora surveys were conducted for the Project between late October 2008 and January 2009, with the ecological assessment being finalised in December 2009 (refer to Appendix F of the EA). Due to the continued agricultural land use of the site, it is not expected that vegetation conditions would have changed substantially in the intervening period. Furthermore, an updated flora and fauna assessment was carried out in late 2010 for the revised bulk water pumping station location as part of this report (refer to Appendix A). Also, as noted above in item ID 4A and discussed in Section 4.4 of this report, habitat surveys for the Pink-tailed Worm Lizard were undertaken in late 2010, which confirmed the vegetation condition in the relevant areas of the site. 	<ul style="list-style-type: none"> Appendix F of the EA. Section 4.4 of this report. ID 4A of this report. Appendix A of this report.
ActewAGL			
7A	Clarification of new bulk water pumping station location, as agreed between ACTEW Corporation and the developer (since submission of EA).	<ul style="list-style-type: none"> Through consultation with ACTEW, the ACT, and QCC, it has been agreed that the bulk water pumping station (located to the east of the ACTEW owned water main) shown in the EA will be moved to the west of the ACTEW owned water main, with the delivery main passing outside the Googong water treatment plant. This change has been driven by operational matters. Section 4.2 of this report addresses all environmental impacts associated the change of location, as well as provide relevant maps and information regarding the minor change to project design. 	<ul style="list-style-type: none"> Section 4.2 of this report.
NSW Office of Environment and Heritage (OEH) (formerly the Department of Environment, Climate Change and Water (DECCW))			
8A	The OEH recommends that the Risk management plan be drafted to comply with the requirements of the <i>Environmental Guidelines: Use of Effluent by Irrigation, DEC, 2004</i> .	<ul style="list-style-type: none"> Statement of Commitment HH1 states that recycled water will meet all relevant guidelines. This includes the <i>Environmental Guidelines: Use of Effluent by Irrigation, DEC, 2004</i>. Statement of Commitment HH2 states that the Recycled water risk management plan (RWRMP) will be prepared in accordance with the <i>Australian National Guidelines for Water Recycling – Managing Health and Environmental Risks</i> (2006) and other relevant national and state guidelines. 	<ul style="list-style-type: none"> Statement of Commitments HH1-HH2.

ID	Comment	Response	Reference
8B	Concerned that adverse impact on the Pink-tailed Worm Lizard, and its habitat, could be caused by overflows from the sewage pumping station. The OEH recommends that any potential overflow of SPS2 be eliminated.	<ul style="list-style-type: none"> Sections 11.1.4, 11.1.5 and 11.1.6 of the EA conclude that there will not be adverse impacts on the Pink-tailed Worm Lizard due to the Project. In addition: <ul style="list-style-type: none"> Further survey and assessment has been undertaken for the species in late 2010 undertaken by Biosis Research (as part of the township's EPBC referral) since the EA was finalised. This has resulted in the proposal to create an <i>Aprasia</i> Conservation Area in the lower Montgomery Creek area for the long-term protection of this species. Experts in this species support this plan and have concluded that the proposal will result in a long-term benefit for the Pink-tailed Worm Lizard. Further detail is provided in Section 4.4 and also ID 4A of this report. As discussed in Section 5.3.2 of the MWH concept design report (Appendix B of the EA), sewage pumping station 2 (SPS2) will include an emergency storage of 560m³. This is in accordance with relevant guidelines (<i>Water Services Association of Australia Sewerage Code of Australia WSA02-2002</i>). Any overflows would be directed into the stormwater management system and then into the drainage lines. Drainage lines do not form suitable habitat for the Pink-tailed Worm Lizard, as discussed in Section 4.4 of this report, as they require drier environments, such as north-facing slopes. 	<ul style="list-style-type: none"> Sections 11.1.4, 11.1.5 and 11.1.6 of the EA. Section 4.4 of this report. ID 4A of this report. Section 5.3.2 of Appendix B of the EA.
8C	Notes that amendments of the Statement of Commitments in relation to Aboriginal Cultural Heritage (H1 and H2) are required.	<ul style="list-style-type: none"> Statement of Commitments H1 and H2 have been amended in accordance with the OEH comments. 	<ul style="list-style-type: none"> Statement of Commitments H1-H2.
8D	Requests clarity around the submission of Aboriginal site recording forms.	<ul style="list-style-type: none"> The Aboriginal site recording forms were submitted to the OEH (former DECCW) by Navin Officer Heritage Consultants in 2003 and 2010. Updated forms following the completion of the Aboriginal heritage assessment and report undertaken as part of the EA were submitted to the OEH on 15 March 2011 (copies have not been appended to this report, however, are available on request). These included updated forms for the previously known Aboriginal heritage items and also the four (4) new Aboriginal heritage items identified during the EA (GWTP1-GWTP4 as detailed in Table 12.1 of the EA). 	<ul style="list-style-type: none"> Table 12.1 of the EA.
8E	Requests that the Statement of Commitments refer to the four heritage sites and that these sites be avoided and protected from impact.	<ul style="list-style-type: none"> Statement of Commitment H1 has been amended in accordance with this OEH comment. 	<ul style="list-style-type: none"> Statement of Commitment H1.

ID	Comment	Response	Reference
8F	The OEH recommends the noise mitigation measures suggested in the EA be incorporated into any consent conditions for the project (eg via a Construction Environmental Management Plan).	<ul style="list-style-type: none"> The noise mitigation and management measures outlined in Sections 13.4.4 (for construction) and 13.4.5 (for operation) of the EA and would be incorporated into a CEMP and/or OEMP for the Project, where appropriate. The Statement of Commitments N1, N1A and N2, detail the specific measures to be undertaken for the management of noise (and vibration) during the construction and operation of the Project. 	<ul style="list-style-type: none"> Sections 13.4.4 and 13.4.5 of the EA. Statement of Commitment N1, N1A and N2.
Queanbeyan City Council (QCC)			
9A	Draws attention to the QCC Tree Preservation Order.	<ul style="list-style-type: none"> The QCC Tree Preservation Order requirements are not applicable under a Part 3A of the EP&A Act assessment. As such, they are not relevant to areas subject to the Project. However, trees (particularly hollow-bearing trees, which are important for biodiversity reasons) would be retained, unless they are required to be removed for essential infrastructure. 	<ul style="list-style-type: none"> Statement of Commitment F1.
9B	Recommends that all construction and operational activities associated with Googong's water supply system and sewerage system follow the Council's <i>Development Specification – Googong</i> .	<ul style="list-style-type: none"> The Project will comply with QCC's <i>Development Specification – Googong</i>. A new Statement of Commitment has been included as D3. 	<ul style="list-style-type: none"> Statement of Commitment D3.
9C	Requests that management plans are prepared prior to construction.	<ul style="list-style-type: none"> A CEMP would be prepared for the Project and would be finalised prior to commencement of construction activities. 	<ul style="list-style-type: none"> Statement of Commitment C1.
9D	Requests submission for compliance certificate (water and sewer) under section 307 of the NSW <i>Water Management Act 2000</i> .	<ul style="list-style-type: none"> The Project will comply with QCC's <i>Development Specification – Googong</i>. Compliance with this commitment will require the submission of an application for a Compliance Certificate under Section 307 of the NSW <i>Water Management Act 2000</i> to the water and wastewater authority (QCC). 	<ul style="list-style-type: none"> Section 3.2 of the EA. Statement of Commitment D3.

ID	Comment	Response	Reference
9E	Requests an acoustic report to determine that noise levels will not exceed the levels specified in the NSW Industrial Noise Policy 2000.	<ul style="list-style-type: none"> An acoustic report prepared in accordance with the relevant NSW guidelines is included as Appendix J of the EA. This noise assessment concluded that the noise levels would not exceed the levels specified in the <i>NSW Industrial Noise Policy 2000</i>. Noise mitigation measures at the WRP include the placement of infrastructure away from receivers and enclosing noisy machinery in buildings. 	<ul style="list-style-type: none"> Appendix J of the EA.
9F	Requests a number of conditions and controls for site management and landscaping.	<ul style="list-style-type: none"> Site management and landscaping measures to manage construction and operational impacts to soils would be included within the CEMP and OEMP. 	<ul style="list-style-type: none"> Section 9.4 and 9.5 of the EA.
9G	Requests that all measures are implemented to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development. This includes noise, hazardous and toxic materials.	<ul style="list-style-type: none"> The CEMP and OEMP will include management and mitigation measures to be implemented during construction and operation activities to prevent and/or minimise environmental harm. Statement of Commitments C1, N1, R1 and R2 address these issues. 	<ul style="list-style-type: none"> Statement of Commitment C1, N1, R1 and R2.
9H	Requests that all plumbing and drainage be carried out in accordance with the NSW <i>Local Government (General) Regulations 2005</i> .	<ul style="list-style-type: none"> All plumbing and drainage would be carried out in accordance with the <i>NSW Local Government (General) Regulations 2005</i>. 	<ul style="list-style-type: none"> Section 5.3 of the EA.
9I	Requests that title restrictions are pursuant to Section 88B of the NSW <i>Conveyancing Act 1919</i> .	<ul style="list-style-type: none"> Where relevant, title restrictions would be pursuant to Section 88B of the NSW <i>Conveyancing Act 1919</i>. It is important to note that there would also be by-laws and precinct/community management statements applicable to Googong, which may be used where section 88B instruments were traditionally applied. 	<ul style="list-style-type: none"> Section 2.3 of the EA.

ID	Comment	Response	Reference
9J	Requests that QCC own and manage the utility services – WRP site, the sewerage pump station sites, the bulk water pump station site, and the water reservoir site – after the initial period of ownership and management by the proponent.	<ul style="list-style-type: none"> Whilst ownership of the project falls outside the EA, the proponent can advise that CIC and QCC have now negotiated that the water cycle infrastructure will be gifted to QCC upon commissioning, under the provisions of the township's Voluntary Planning Agreement (VPA), which was adopted by QCC on 23 March 2011. 	<ul style="list-style-type: none"> Statement of Commitments C1 and OP3.
9K	Requests that all environmental risks be managed appropriately.	<ul style="list-style-type: none"> Statement of Commitments R1 and R2 address the management of environmental risks during construction and operation. A further risk assessment will be undertaken during the development of the CEMP and OEMP. The CEMP and OEMP will include measures to manage environmental risks. 	<ul style="list-style-type: none"> Statement of Commitments R1-R2.
9L	Requests that the bulk water pump station be designed and constructed to the requirements of ActewAGL and must provide for supply from Googong or the Stromlo water treatment plants.	<ul style="list-style-type: none"> The bulk water pumping station and the connection to the Googong to Stromlo water supply pipeline have been designed in consultation with ActewAGL. The designs shown in Appendix B of the EA identify that supply can be provided from either Googong or the Mt Stromlo water treatment plants. Section 4.2 of this report provides updated information regarding the bulk water pumping station. 	<ul style="list-style-type: none"> Appendix B of the EA. Section 4.2 of this report.

ID	Comment	Response	Reference
NSW Office of Water			
10A	Requests further assessment of the existing ecological value of the Googong Creek and its supporting riparian zone within the project site and downstream to the confluence with the Queanbeyan River.	<ul style="list-style-type: none"> • Ecowise Environmental undertook an aquatic ecology assessment of Googong Creek and Queanbeyan River in 2008. This assessment related to a previous proposal for the discharge of excess recycled water, which involved constructing a pipeline directly into the lower Googong Creek. Further detail from this 2008 assessment is provided in Section 3.2 of this report. • Following this assessment, in consultation with the DPI and OEH and the Murrumbidgee Catchment Management Authority, and in accordance with the relevant NSW government guidelines, it was determined that the discharge of excess recycled water should be moved to the upper Googong Creek area. • This resulted in the following environmental benefits: <ul style="list-style-type: none"> • Increased dilution of the excess recycled water. • Increased treatment of residual nutrients in the excess recycled water within the stormwater management system prior to leaving the site. • Increased ability to moderate flows, through discharging excess recycled water into the stormwater management system. • Sections 3.2 and 3.3 of this report provide further assessment of aquatic ecology, considering the previous assessments undertaken and the stormwater management strategy. • Importantly, it should be reiterated here that the Part 3A EA is solely concerned with the excess recycled water component of the flows leaving the site through the stormwater management system. 	<ul style="list-style-type: none"> • Sections 3.2 and 3.3 of this report.
10B	Request further assessment of the ecological impacts due to the proposed modification to flows in Googong Creek.	<ul style="list-style-type: none"> • As noted in ID 10A above, the Part 3A EA examines the excess recycled water component of the flows leaving the site through the stormwater management system. • Section 11.2 of the EA provides an assessment of the changes to water flow on the aquatic ecology of Googong Creek. This concludes that the changes to water flow as a result of the Project are unlikely to have a significant impact on aquatic ecology. • Sections 1.5.4 and 3.3 of this report discuss the stormwater management system that is assessed under Part 4 of the EP&A Act. 	<ul style="list-style-type: none"> • Sections 1.5.4 and 3.3 of this report. • Section 11.2 of the EA.

ID	Comment	Response	Reference
10C	Recommends that the impact on the Queanbeyan River be assessed in terms of flow regime (a range of percentile flows) and the associated ecological response.	<ul style="list-style-type: none"> The impacts for a range of percentile flows and the associated ecological impact for the Googong Creek and the Queanbeyan River were assessed in Sections 7.5.4 and 11.2 of the EA, respectively. The changes to the flow regime of the Queanbeyan River due to the predicted modification to the flows within Googong Creek has been assessed and detailed in Section 7.5.4 of the EA. Table 7.8 of the EA provides a summary of the predicted changes to the flow in Googong Creek at the completion of Stage 1 of the Project (ie the approval being sought for the Project under Part 3A of the EP&A Act) and at ultimate development. The main impact to the existing flow of the Googong Creek would be an increased seasonal variation between the 50th and 80th percentile flows. Table 7.9 of the EA compares 50th percentile flow in the Queanbeyan River with the modelled existing and future (Stage 1 of the Project) flows in Googong Creek. Given the minor contribution of the 50th percentile flows from Googong Creek to the flows in the Queanbeyan River (less than 1 percent both pre- and post-development) assessment of impacts at other percentile flows was not undertaken. Water flow and water quality parameters would be managed and maintained via the monitoring and adaptive management program of the Queanbeyan River detailed in Section 7.3 of the EA and Statement of Commitment WQ4. The impacts of higher flows and flow variability on aquatic ecology in the Queanbeyan River due to the Project are assessed in Section 11.2 of the EA. In particular, Section 11.2.4, states that the assessment undertaken considered the following key issues: <ul style="list-style-type: none"> Impacts of increased water flow on aquatic flora and fauna in the Queanbeyan River. Impacts of any changes in water quality on aquatic flora and fauna in the Queanbeyan River. Given the available data a qualitative assessment of the impacts on aquatic ecology was undertaken. Regular monitoring at the confluence of Googong Creek and the Queanbeyan River will be undertaken throughout the Project to determine any impacts on aquatic ecology (Statement of Commitment A1). 	<ul style="list-style-type: none"> Sections 7.3, 7.5.4, 11.2 and 11.2.4 and Tables 7.8 and 7.9 of the EA. Appendix D of this report. Statement of Commitments WQ4 and A1.
		<ul style="list-style-type: none"> In addition, Appendix D of this report provides a letter prepared by Brown Consulting, which states that whilst there will be modification to the hydrological regime of Googong Creek with more regular flows, these flows will contribute to improving the health of the downstream waterways including the Murrumbidgee and Murray Darling Basin. 	

ID	Comment	Response	Reference
10D	Requests that appropriate mitigating, monitoring and contingency measures be outlined.	<ul style="list-style-type: none"> The EA details the monitoring activities and adaptive management approach that is proposed for the Project (refer to Section 7.3 of the EA). In particular, detailed monitoring will be undertaken for the first five (5) years of operation (that is, during Stage 1 of the Project), to inform the ultimate stage of the Project. Regular monitoring will include water quality and flows at several locations. This is likely to include: <ul style="list-style-type: none"> At the outlet of the WRP. At Googong Dam Road (ie where stormwater flows leave the site). At the confluence of Googong Creek and the Queanbeyan River. The EA details mitigation and contingency measures that would be informed by the monitoring noted above. These would be included and further elaborated in the CEMP and OEMP for the Project, which would be developed during the detailed design phase (refer to the Statement of Commitment WQ4). 	<ul style="list-style-type: none"> Section 7.3 of the EA. Statement of Commitment WQ4.
10E	Consider the impacts to the flow regime and ecology of Montgomery Creek. Confirmation is requested as to why this has not been addressed within the EA in consideration of the concept plan status and overall proposed assessment of the Googong Township development.	<ul style="list-style-type: none"> Impacts of the discharge of excess recycled water on the flow regime and ecology of Montgomery Creek due to the Project being assessed under Part 3A of the EP&A Act are not possible. All these discharges from the WRP will be to the Googong Creek catchment (as shown in Figure 4 of this report), which flows directly to the Queanbeyan River. No flows will be discharged to the catchment of Montgomery Creek. Impacts on Montgomery Creek have been considered and assessed separately under Part 4 of the EP&A Act, as part of the assessment of the stormwater management strategy. The masterplan for the Googong township has considered the Montgomery Creek corridor in detail and includes the restoration of the original 'chain of ponds' creek form, which has been altered by the installation of farm dams during the past agricultural uses of the site. 	<ul style="list-style-type: none"> Figure 4 of this report.

ID	Comment	Response	Reference
10F	Consider the existence of and potential impact to any water users who may extract water from Googong Creek or the Queanbeyan River.	<ul style="list-style-type: none"> As noted in ID 10A above, the Part 3A EA is solely concerned with the excess recycled water component of the flows leaving the site through the stormwater management system. There are no existing licenced water users who extract water from Googong Creek or the Queanbeyan River. However, there are existing (riparian rights) users of surface water from the Queanbeyan River downstream of the Googong township. These users are generally rural properties located on the western side of the river on Wickerslack Lane. The EA concluded (Sections 7.5.3 and 7.5.4) that the water quality in the Queanbeyan River would be maintained or improved throughout the operation of the Project. Further clarification of the modelling and analytical assessment undertaken by Brown Consulting (Appendix D of this report) supports this conclusion. Furthermore, any potential human health risks associated with the discharge of excess recycled water and the use of recycled water within the Googong township will be assessed further as part of the Recycled Water Risk Management Plan (RWRMP) that will be prepared during the detailed design phase (refer to Statement of Commitment HH2). 	<ul style="list-style-type: none"> Sections 7.5.3 and 7.5.4 of the EA. Appendix D of this report. Statement of Commitment HH2. ID 10A of this report.

ID	Comment	Response	Reference
10G	Supports the recommended further groundwater assessment items noted in Table E1 of the Appendix E (of the EA). However, the NSW Office of Water (NOW) highlights a risk associated with delaying further assessment.	<ul style="list-style-type: none"> The recommendations noted in Table E1 of Appendix E of the EA have been developed in consultation with NSW Office of Water (Tim Baker). This includes the proposed timing of activities. The EA (Chapter 10) assessed the impacts of the Project on groundwater during both construction and operation and concluded that these impacts would be minor. The groundwater related risks are: <ul style="list-style-type: none"> Isolated water logging of soils. Changes to the groundwater regime. Groundwater salinity risks, such as the lateral migration of salts in the shallow zone, accumulation of mobile salts at waterways and the discharge of saline water into streams. The decline in recharge of groundwater, such as the drying of perched water tables beneath developed portions of the site, lowering of the water table and possible drying up of shallow bores in the area and a potential increase in the total dissolved solids content of the groundwater. It is considered that the risks (or impacts) associated with approving Stage 1 of the Project with the current level of groundwater assessment are minimal due to: <ul style="list-style-type: none"> Changes to infiltration and groundwater recharge regime are likely to occur as a result of the approved Googong township – that is, changing the land use from agricultural to urban, which the NSW Government approved in the 2009 rezoning. Changes to groundwater recharge are going to be a balance of reduced permeability of the landscape (likely decrease in recharge) and increased irrigation of areas of the township (likely increase in recharge). This can only be established when people are living in the township. The timing of further groundwater assessment is part of an overall program of further monitoring and assessment, which is coordinated with the staging of the construction of the township. The groundwater assessment results will need to be considered in conjunction with measured (rather than modelled) water cycle parameters, which can only be collected after residents are living in the township. The staging of the project allows for the incorporation of monitoring results and consequent recommendations into future stages, and overall IWC operation. 	<ul style="list-style-type: none"> Chapter 10, Sections 10.7 and 10.8 of the EA. Table 12 of this report. Table E1 of Appendix E of the EA. Statement of Commitments G3, G6, G7 and G8.

ID	Comment	Response	Reference
		<ul style="list-style-type: none"> The proposed monitoring and adaptive management program (detailed in Section 10.7 of the EA and Table 12 of this report) has been developed to allow base levels to be established and, as a result, targets for the Project to be determined. Given the impacts are likely to be minor (as Section 10.8 of the EA concludes), this monitoring and adaptation approach is considered appropriate and will promote best practice water management. The timing for the program will commence as soon as the Project is approved and will continue through operations. Statement of Commitments G3, G6, G7 and G8 detail the monitoring to be undertaken for the Project. Statement of Commitment G8 provides that the further groundwater assessment as discussed in the EA (Section 10.7 and the timing of which is specified in Table 12 of this report) should be included within any conditions of approval for the Project. 	

2.4 Response to community submissions

Table 3 Response to community submissions received by the DPI in December 2010

ID	Comment	Response	Reference
Wickerslack Lane resident #1			
5A	Recommends that greater attention should be given to the details of stormwater management, as the Project is intimately associated with the proposals for stormwater management.	<ul style="list-style-type: none"> Further information and detail on stormwater management is provided in Section 3.3 of this report. It is noted, however, that the stormwater management system is assessed and approved under Part 4 of the EP&A Act. 	<ul style="list-style-type: none"> Section 3.3 of this report.
5B	Notes that the geological and geomorphological assessments for the EA are literature reviews, and that no detailed surveys appear to have been done to identify special aspects that may have important implications for this proposal.	<ul style="list-style-type: none"> A Recycled water irrigation land capability assessment (refer to Appendix D of the EA) was undertaken by Agsol and a Groundwater assessment (Appendix E of the EA) was undertaken by CMJA. Both reports discussed soils, geology and geomorphology in detail and assessed the potential impacts relating to the Project. Agsol undertook a field soil survey and soil testing and analysis in 2009 (refer to Chapter 6 of Appendix D of the EA). These detailed results lead to the conclusion that the site was suitable for recycled water application. The CMJA report (refer to Appendix E of the EA) summarised the geological landscape of the area and included field verification of desktop information. It is noted that further geotechnical investigations will be undertaken prior to construction of pipelines and other permanent infrastructure. Further groundwater studies (refer to Table 12 of this report) will also identify more detailed geological and geomorphological information. 	<ul style="list-style-type: none"> Appendix E of the EA. Chapter 6 of Appendix D of the EA. Table 12 of this report. Statement of Commitment G3.

ID	Comment	Response	Reference
5C	Notes that the aquatic ecology assessment is extremely important to the impact of the discharges on the Queanbeyan River. No detailed monitoring of the river ecology appears to have been undertaken and to be proposed for the future.	<ul style="list-style-type: none"> Statement of Commitment A1 ensures that a detailed water quality and aquatic ecology monitoring program will be developed and implemented. The monitoring program will include siting of an aquatic ecology monitoring station at the junction of Googong Creek and the Queanbeyan River (refer to Figure 7.3 of the EA) to ensure viable comparison with historical and other recent river ecology data. Further detail regarding the preliminary aquatic ecology assessment conducted by Ecowise Environmental in 2008 is summarised in Section 3.2 of this report. This preliminary assessment concluded that there were potential ecological risks associated with the discharge of excess recycled water directly into Queanbeyan River. As a result of this conclusion and considering the relevant NSW guidelines, the discharge point was re-located to within the township, so that further mitigation of potential impacts could occur through discharge into the stormwater management system. Additional mitigation would occur through the attenuation of flows through the stormwater management system and Googong Creek before they reach the Queanbeyan River. It is noted (in Sections 7.5.3 and 7.6 of the EA) that the Project would result in water quality with similar nutrient levels and lower suspended solids levels than the ambient conditions in the Queanbeyan River. With or without excess recycled water flows, the stormwater quality leaving the Googong township site below the Googong Dam Road will meet all the applicable water quality targets (as described by Brown Consulting in Appendix D of this report). As described in Section 3.2.7 of this report a monitoring and adaptive management regime is proposed. A water quality and aquatic ecology monitoring program to monitor Googong Creek and the Queanbeyan River will be established prior to construction, and will be maintained throughout construction and operation to ensure that the existing ecological health of both watercourses is maintained. Statement of Commitments OP1 and WQ4 relate to this monitoring program. 	<ul style="list-style-type: none"> Statement of Commitments A1, OP1 and WQ4. Sections 7.5.3 and 7.5 and Figure 7.3 of the EA. Section 3.2 of this report. Appendix D of this report.

ID	Comment	Response	Reference
5D	Notes that there is a need to ensure that the discharge from Googong does not further degrade the Queanbeyan River ecosystem, and to ensure that relative impacts from Googong Dam discharge and Googong Township discharge can be distinguished in the monitoring program.	<ul style="list-style-type: none"> Statement of Commitment A1 ensures that a detailed water quality and aquatic ecology monitoring program will be developed and implemented at the confluence of Googong Creek and the Queanbeyan River. The proposed monitoring at the confluence of Googong Creek and the Queanbeyan River, combined with the existing monitoring locations upstream and downstream of this confluence, will enable the flows and water quality from Googong Creek and Googong Dam discharge to be distinguished. As requested by NSW government agencies, the ambient water quality would be maintained or improved. 	<ul style="list-style-type: none"> Statement of Commitment A1.
5E	Comments on the lack of surface and groundwater flow to underpin the hydrological modelling, which seems to be entirely computer based. Specifically there is no study of current discharges from Googong Creek, and the impacts of increased discharges through the creek as a consequence of the Googong Township Development.	<ul style="list-style-type: none"> The assessment of current and predicted flow in Googong Creek is presented in Section 7.5 of the EA. It relies on historical rainfall data and MUSIC model scenarios. It is noted in the EA that due to limited existing data on surface water flow in the Queanbeyan River and Googong Creek, it is important that monitoring commences 12 months prior to commissioning of the WRP. Site specific data and current flows of the Googong Creek will be collected under the proposed monitoring program (Statement of Commitment A1). 	<ul style="list-style-type: none"> Statement of Commitment A1. Section 7.5 of the EA.

ID	Comment	Response	Reference
5F	<p>Raises concern that important groundwater/surface water studies have been undertaken in a time of drought. The recent rains and flooding have underscored the importance of groundwater recharge and discharge from surface aquifers dominated by fracture porosity, and flash flood regimes in both the creeks and the Queanbeyan River. These situations do not seem to have been adequately considered in the proposal.</p>	<ul style="list-style-type: none"> • A Groundwater impact assessment (detailed in Section 10.2 of the EA) was undertaken to determine the impact of the project on the following groundwater-related risks: <ul style="list-style-type: none"> • Isolated water logging of soils. • Changes to the groundwater regime. • Groundwater salinity risks, such as the lateral migration of salts in the shallow zone, accumulation of mobile salts at waterways and the discharge of saline water into streams. • The decline in recharge of groundwater, such as the drying of perched water tables beneath developed portions of the site, lowering of the water table and possible drying up of shallow bores in the area and a potential increase in the total dissolved solids content of the groundwater. • Sections 10.4 and 10.5 of the EA considers that the risks (or impacts) associated with approving Stage 1 of the Project with the current level of groundwater assessment are low due to: <ul style="list-style-type: none"> • Changes to infiltration and groundwater recharge regime are likely to occur as a result of the approved Googong township – that is, changing the land use from agricultural to urban, which the NSW Government approved in the 2009 rezoning. • Changes to groundwater recharge are going to be a balance of reduced permeability of the landscape (likely decrease in recharge) and increased irrigation of areas of the township (likely increase in recharge). This can only be established when people are living in the township. • The timing of further groundwater assessment is part of an overall program of further monitoring and assessment, which is coordinated with the staging of the construction of the township. Table 12 of this report provides the updated timing of the additional groundwater studies to be undertaken. • The groundwater assessment results will need to be considered in conjunction with measured (rather than modelled) water cycle parameters, which can only be collected after residents are living in the township. • The staging of the project over 25 years allows for the incorporation of monitoring results and consequent recommendations into future stages, and overall integrated water cycle operation. 	<ul style="list-style-type: none"> • Sections 10.2, 10.4 and 10.5 of the EA. • Section 1.5.4 and Table 12 of this report. • Statement of Commitments G1–G8.

ID	Comment	Response	Reference
		<ul style="list-style-type: none"> Statement of Commitments G1-G8 provide that groundwater quality will be closely monitored as part of the proposed monitoring and adaptive management program (specified in Statement of Commitment G8) to ensure that adverse impacts are minimised. These commitments cover groundwater recharge, contamination, water quality, drainage, mounding, waterlogging and salinity (particularly related to impacts on soil and plant growth). The groundwater monitoring and adaptive management program would be undertaken prior to and during construction and operation of the Project to further investigate the groundwater environment, potential changes to recharge, and the likelihood of long-term impacts. In response to flash flooding and other surface water aspects of the township, these are assessed separately under Part 4 of the EP&A Act (refer to Section 1.5.4 of this report). 	
5G	Raises concern that the leakage of raw sewage will degrade water quality in the Queanbeyan River during times of high flow through the system.	<ul style="list-style-type: none"> The Project assessed under Part 3A of the EP&A Act includes the sewage pumping stations and rising mains and the WRP described in Section 5.3.2 and 5.3.3 of the EA, respectively. Other components of the sewerage system (ie the reticulation mains) are being assessed under Part 4 of the EP&A Act. The risk of leakage of raw sewage into the catchment of the Queanbeyan River due to the operation of the Project is considered to be very low. The system is designed as a reduced infiltration sewerage system so leakage of raw sewage during dry weather is unlikely. The pumping stations and the WRP have been designed to operate effectively during wet weather and emergency events (such as power failures). For example, they will include capacity for emergency storage of sewage in accordance with agency requirements. The proposed monitoring and adaptive management program (Statement of Commitment G8 and WQ4) during the construction and operation of the Project will ensure water quality in the Queanbeyan River is maintained. 	<ul style="list-style-type: none"> Sections 5.3.2 and 5.3.3 and of the EA. Statement of Commitments G8 and WQ4.

ID	Comment	Response	Reference
Wickerslack Lane resident(s) #2			
6A	Seeks clarification as to why the 75 th percentile and maximum faecal coliform concentrations presented in Table 7.2 of the EA for the Wickerslack Lane monitoring site are the same.	<ul style="list-style-type: none"> Table 7.2 of the EA provides water quality information for the three (3) monitoring sites (QBN 704, QBN 703 and QBN 769) on the Queanbeyan River. These sites are shown in Figure 3 of this report. This water quality information was obtained from extracted data prepared by Ecowise Environmental (as part of the preliminary assessment report undertaken in 2008) for the period 1994 – 2008 for ACTEW Corporation. Only one (1) faecal coliform sample was taken at that site during the sampling period. Therefore, the 75th percentile and maximum values are the same. 	<ul style="list-style-type: none"> Table 7.2 of the EA. Figure 3 of this report.
6B	Seeks clarification regarding the data presented in the EA relating to aquatic ecology – specifically, seeking information about macro invertebrates (such as their composition) that was not provided in the EA.	<ul style="list-style-type: none"> Section 3.2 of this report provides further information on the macro invertebrate analysis that was undertaken during the assessment for the Project. It includes information on the outcomes of the aquatic health and habitat assessments for the Queanbeyan River. Macro invertebrate ecology is the most appropriate indicator to measure the ecological health of the river and was used as a basis of the assessment. This is in accordance with industry standards for measuring river health. Macro invertebrate ecology is measured through the observed/ expected (O/E) ratio of macro invertebrate composition and abundance. It is assessed using the Rapid Bio-assessment protocols defined in the <i>Australian River Assessment System</i> (referred to as the AusRivas), <i>Sampling and Processing Manual</i>. This is a standard method for assessing the ecological health of freshwaters through biological monitoring and habitat assessment. The model predicted the macro invertebrates expected to occur at the test site on the basis of its environmental attributes. When a test site is sampled, the observations are compared to the model's expectations for that habitat and the resulting O/E ratio is regarded as the integrated indicator of river health. The score is then used to categorise rivers into bands to describe the overall condition and severity of the disturbance. The results of the assessment are presented in Section 3.2.3 of this report. 	<ul style="list-style-type: none"> Sections 3.2 and 3.2.3 of this report.

ID	Comment	Response	Reference
6C	Considers that Tables 11.4 and 11.5 in the EA do not provide adequate baseline data.	<ul style="list-style-type: none"> Section 11.2 of the EA provides information on the aquatic ecology assessment undertaken during the preparation of the EA. Tables 11.4 and 11.5 use the AusRivas modelling to provide the observed over the expected ratios. These ratios have been used to describe the baseline health of the Queanbeyan River. Table 11.4 has been updated as Table 7 in Section 3.2 of this report. This section provides further clarification of the aquatic ecology assessment undertaken for the EA. It concludes that the Project, as also detailed in Section 11.2.4 of the EA, will not significantly impact on the aquatic ecology of the Queanbeyan River. A detailed monitoring program will be undertaken to assess the potential impacts of the Project in the Queanbeyan River (including water quality, flow, fish migration, macrophytes and macro invertebrate communities) prior to and during construction and operation of the Project. This program will enhance the available baseline data and is addressed by the Statement of Commitment WQ4. 	<ul style="list-style-type: none"> Section 11.2, Tables 11.4 and 11.5 of the EA. Section 3.2 and Table 7 of this report. Statement of Commitment WQ4.
6D	Comments that over 40 years there has been a shift in the ecology since construction of the Googong Dam. Comments that the water released from the Dam has been free of faecal and urban stormwater contamination.	<ul style="list-style-type: none"> Water released from the Googong Dam has been monitored at Site QBN 704 (refer to Figure 7.3 of the EA). Table 7.2 of the EA provides that faecal coliforms at this site, and further downstream at the Wickerslack Lane Site (QBN 703) are low. As required by the NSW Government, the ambient water quality in the Queanbeyan River will be maintained throughout the construction and operation of the Project. As noted in Sections 3.2 and 3.3 of this report, and in Appendix D of this report, for some parameters it is likely that the water quality downstream of the site would be improved during operation of the Project. 	<ul style="list-style-type: none"> Figure 7.3 and Table 7.2 of the EA. Sections 3.2 and 3.3 of this report. Appendix D of this report
6E	Seeks clarification about the specific data (parameters) to be collected at the proposed monitoring station at the junction of Googong Creek and Queanbeyan River and the timing of commencement of monitoring.	<ul style="list-style-type: none"> The new monitoring station will commence collection of relevant water quality and flow data 12 months prior to commissioning of the WRP (Statement of Commitment WQ4). Data proposed to be collected includes: biological oxygen demand, total suspended solids (turbidity), total nitrogen, ammonia, total phosphorus, total dissolved solids (salts), faecal coliforms, pH, free chlorine (residual) and oil/grease. These parameters would be confirmed with OEH during the detailed design phase of the Project. Data collection would be undertaken by a suitably qualified specialist under contract to the operator of the WRP (initially under the direction of CIC and then QCC). 	<ul style="list-style-type: none"> Statement of Commitment WQ4.

ID	Comment	Response	Reference
6F	Seeks clarification regarding whether the Project is likely to increase the spread of weeds downstream of the site and, if so, what mitigation measures are proposed and who would undertake them.	<ul style="list-style-type: none"> In relation to the water cycle project infrastructure construction and operation, weed management will be undertaken and detailed in the CEMP and OEMP. This will ensure that weeds are both managed within the areas subject to the Project and prevented, as practically as possible, from leaving the infrastructure sites. 	<ul style="list-style-type: none"> Appendix F of the EA. Statement of Commitment F1.
6G	Seeks confirmation that there will be adequate funding available to complete the construction of all stages of the WRP and to operate the system.	<ul style="list-style-type: none"> The staging of the WRP is discussed in Section 5.3.3 of the EA (in particular, refer to pages 68 and 69, Table 5.4 and Figure 5.12). Operation of the WRP is discussed in Section 5.5.5 of the EA. Detailed information regarding the design, staging and operation of the WRP is provided in the Concept Design Report prepared by MWH (Appendix B of the EA – refer to Sections 1.6, 2.5, 6.2 and 6.14). The WRP (as well as other water cycle infrastructure) will be staged in accordance with the growth of the township. This allows the costs for the infrastructure to be spread over several years. The business case for the Project has been prepared and it is expected to be funded through standard financial mechanisms available to developers. The costs of the Project are incorporated into the Voluntary Planning Agreement for the township, which has been recently accepted by QCC. 	<ul style="list-style-type: none"> Sections 5.3.3 and 5.5.5, Table 5.4 and Figure 5.12 of the EA. Appendix B of the EA.
6H	Seeks confirmation that adequate management and funding will be available with regards to emergency management for the WRP and system.	<ul style="list-style-type: none"> Statement of Commitment R2 addresses this comment. Emergency management plans would be prepared for all aspects relating to emergency and incident management and response, and would be included in the preparation of the CEMP and OEMP for the Project. 	<ul style="list-style-type: none"> Statement of Commitment R2.

ID	Comment	Response	Reference
61	Seeks confirmation that adequate treatment, management and monitoring would be undertaken with regards to potential levels of pathogens and chemicals in stormwater (including excess recycled water) entering the Googong Creek and Queanbeyan River.	<ul style="list-style-type: none"> A recycled water discharge licence will be sought for the Project and would be issued and administered by NSW Office of Environment and Heritage (OEH) (the former Department of Environment, Climate Change and Water). It would provide 90th percentile concentration limits for all pathogens and chemicals leaving the WRP. MWH have confirmed that the WRP treatment process will achieve the OEH's proposed licence limits (refer to Appendix B of this report). In addition, the OEH also proposes to establish maximum concentration limits (on recycled water quality) after suitably reliable performance data for the WRP is available after commissioning. The future operator of the WRP (QCC) would be required to monitor the water quality and ensure that these licence conditions are met. Risks from the operation of the Project would be mitigated through the preparation of a Recycled Water Risk Management Plan (Statement of Commitment HH2). The plan would be prepared in accordance with the <i>Australian National Guidelines for Water Recycling – Managing Health and Environmental Risks 2006</i> and will identify the significant human and environmental health risks and require validation, operational and verification monitoring. 	<ul style="list-style-type: none"> Appendix B of this report. Statement of Commitment HH2.

ID	Comment	Response	Reference
6J	Requested clarification on who will be responsible for the storage of chemicals at the WRP and ensuring that staff are trained to respond to emergency situations (eg bushfire or severe storm events).	<ul style="list-style-type: none"> • QCC will be responsible for the long-term operation of the WRP. This will include the management of chemicals stored on-site and the training of staff in chemical storage and handling and emergency response. • Section 13.5.5 of the EA assesses the chemicals to be used during the operation of the WRP. Potential hazards and risks associated with the use of chemicals at the WRP are associated with spillage of chemicals during operations and maintenance activities or during emergency situations. • As required by Statement of Commitment R1, measures to mitigate these risks are: <ul style="list-style-type: none"> • The storing of quantities on the site within the relevant thresholds. • Undertaking activities in accordance with the relevant Material Safety Data Sheets. • Installing bunded areas for the storage and delivery of chemicals in accordance with Australian Standards and the relevant Material Safety Data Sheets. • Developing and implementing appropriate procedures for delivering, handling and accidental spills of chemicals. • Furthermore, Statement of Commitment R2 requires the preparation of the OEMP and the Recycled Water Risk Management Plan. These documents will outline the management of emergency situations for all key water cycle infrastructure. 	<ul style="list-style-type: none"> • Section 13.5.5 of the EA. • Statement of Commitments R1 and R2.
6K	Seeks confirmation that the data used in the water flow modelling was the most appropriate for the site and would adequately account for storm events.	<ul style="list-style-type: none"> • Water quality and flow modelling for Googong Creek and Queanbeyan River is based on 40 years of rainfall data sourced from the Bureau of Meteorology. The Recycled Water Irrigation Land Capability Assessment (Appendix D of the EA) and the Stormwater Strategy (Appendix M of the EA) have been modelled using the same set of rainfall data. This ensures that all modelling takes into account a range of weather conditions and patterns. • As noted in Appendix D of this report, relevant standards and guidelines have been used in the stormwater modelling, as well as CSIRO information to take into account the potential effects of climate change. 	<ul style="list-style-type: none"> • Appendix D of the EA. • Appendix M of the EA. • Appendix D of this report.

ID	Comment	Response	Reference
6L	Raised concerns that the Project could result in increased erosion and sedimentation during construction, resulting in potential impacts downstream on Queanbeyan River.	<ul style="list-style-type: none"> Sections 9.4 and 9.5 of the EA relate to the management of soil erosion and sedimentation risks during construction and operation. The CEMP and OEMP will include detailed management measures related to sediment and erosion control. The EA concludes that the construction of the Project is unlikely to result in any erosion or sedimentation impacts. As identified in Appendix D of this report, modelling shows that the stormwater management system would meet applicable turbidity targets. 	<ul style="list-style-type: none"> Sections 9.4 and 9.5 of the EA. Statement of Commitments WQ3 and WQ5. Appendix D of this report.
6M	Seeks clarification regarding the risk assessment for water quality (during the operation phase) in the EA.	<ul style="list-style-type: none"> The risk assessment undertaken as part of the EA (Table 15.1) indicates that changes in water quality during the operation phase after mitigation are unlikely or rare, with an overall rating of moderate or low. 	<ul style="list-style-type: none"> Table 15.1 of the EA.
6N	Seeks clarification regarding whether the Queanbeyan River would become unsuitable for household and recreational use as a result of the Project.	<ul style="list-style-type: none"> In accordance with NSW Government requirements, the ambient water quality of the Queanbeyan River will be maintained and there will be no negative impact to the ambient conditions of the river as a result of the Project. It should be noted that the existing water in the Queanbeyan River at Wickerslack Lane is not currently treated and potentially includes water from the entire catchment (about 90,000ha), which includes a wide range of land uses. The stormwater from the Googong township (about 780ha or 0.87% of the total 90,000ha Queanbeyan River catchment), including excess recycled water (which is treated to a very high standard in the WRP), will be treated using a series of stormwater management measures, such as swales and ponds prior to leaving the site in a controlled manner. The stormwater and recycled water quality will be required to meet relevant guidelines and licences. 	<ul style="list-style-type: none"> Section 7.5 of the EA.
6O	Recommends that the objectives for water quality and environmental flows (Under section 4 of the Management Plan of the Queanbeyan River Corridor published in 1999) are followed as a part of the Googong Township.	<ul style="list-style-type: none"> QCC are currently seeking to engage a consultant to revise the <i>Queanbeyan River Corridor Plan of Management</i>. QCC propose to release a draft for public comment in October 2011. It is recommended that, in revising this Plan of Management, QCC work with CIC and ACTEW Corporation in developing appropriate future water quality and environmental flow objectives for the Queanbeyan River downstream of the Googong Dam. This should consider that both the Googong Dam and the Googong township stormwater management system are able to manage flows. 	<ul style="list-style-type: none"> Section 16.2.1 of the EA.

2.5 Response to submissions received in April 2011

Table 4 Response to the additional community submissions received through DPI in April 2011

ID	Comment	Response	Reference
Wickerslack Lane Resident #3			
11A	Seeks clarification regarding the use of a membrane bioreactor (MBR) treatment system with chlorination and ultraviolet treatment, rather than using a reverse osmosis system.	<p>An extensive planning and concept design process was undertaken to select the treatment process presented in the Part 3A EA. The five-stage membrane bioreactor (MBR) treatment system was selected over other options because:</p> <ul style="list-style-type: none"> The MBR process was able to meet the water quality requirements to enable unrestricted non-potable recycled water use within the Googong township and discharge to the environment. The MBR process would not create waste products that are difficult to dispose of, such as a saline solution that is produced by a reverse osmosis system. <p>Sections 4.3.1, 4.5.1 and 4.6 of the EA discuss the alternatives considered and the reasons behind the selection of the proposed system in more detail.</p>	<ul style="list-style-type: none"> Sections 4.3.1, 4.5.1 and 4.6 of the EA.
11B	Seeks confirmation that the excess recycled water discharged into the stormwater management system (and then into Googong Creek and Queanbeyan River) is of suitable water quality to meet human health standards.	<p>The excess recycled water that would be discharged into the stormwater management system within the Googong Creek catchment is the same recycled water that would be used throughout the Googong township (except that it would not be chlorinated).</p> <p>It will be classed as 'unrestricted non-potable re-use', which is the highest category of recycled water quality and means that it must meet relevant human health standards. For example, it can be used for outdoor irrigation, toilet flushing and clothes washing.</p> <p>The discharge from the WRP will be closely monitored to ensure that it is meeting human health and environmental standards.</p>	<ul style="list-style-type: none"> Section 4.3 of this report. Chapter 8 of the EA.

ID	Comment	Response	Reference
11C	Proposes that, if the discharge of excess recycled water is likely to result in human health impacts downstream, a source of potable water or rainwater should be supplied to Wickerslack Lane residents who currently extract water from the Queanbeyan River.	<p>It is understood from their submission that this Wickerslack Lane resident, who extracts water from the Queanbeyan River, currently uses the river water for cooking, washing dishes, bathing and teeth cleaning (potable uses), and that they are concerned that their riparian rights to draw water for domestic and stock uses will be affected as a result of Googong's treatment plant and excess recycled water discharges via the township's stormwater system.</p> <p>In terms of the current suitable uses of water from the Queanbeyan River below the Googong Dam; ACTEW notes that: '<i>... Googong dam is in an occupied rural catchment which includes farmlands and small communities, the water quality from this catchment can be variable and requires extensive treatment</i>' (www.actewagl.com.au/water/treatment). To that end, ACTEW operates a treatment plant immediately below the Googong Dam to treat water to potable standard prior to regional distribution via the mains pipe network. The water in the River below the dam does not go through this treatment process.</p> <p>The NSW Government and Queanbeyan City Council stipulate that the ambient (non-potable) water quality in the Queanbeyan River must be maintained. This is the overarching design requirement for the project to meet, which indirectly also protects the riparian rights of this resident, as well as other residents (as noted in Submission 12) who use the water for non-potable applications.</p> <p>Googong's water treatment and recycling plant meets the highest health, safety and environmental standards, and stormwater releases are also subject to strict regulations. Any water discharged from the plant into the Queanbeyan River will be treated to a Class A standard (in accordance with federal and NSW government regulations), which is designed for unrestricted household non-potable use and human contact (refer to response in ID 11B).</p> <p>The water will also be used as a non-potable domestic water source throughout the Googong township.</p> <p>Given the overarching requirement for the health of the river system to be maintained, the riparian rights of residents will not be impinged by any excess recycled water discharges from the Googong township.</p> <p>Therefore, the proponent does not need to provide an additional source of potable water for residents of Wickerslack Lane.</p>	<ul style="list-style-type: none"> Chapter 8 of the EA. Section 3.3 of this report.

ID	Comment	Response	Reference
11D	Recommends that outflow and environmental flows from Googong Dam continue, and that further flows are released from the Dam if required.	<p>The proponent will consult with ACTEW and ActewAGL regarding long-term environmental flows in the Queanbeyan River (refer to Statement of Commitment CS1). It is agreed that a coordinated approach to flow management, where the presence of Googong Dam and the township are both considered.</p> <p>However, the environmental flows from the Googong Dam are ultimately outside of the scope of the Part 3A environmental assessment and approval process. This is the responsibility of ACTEW Corporation and ActewAGL in consultation with the NSW Government authorities.</p>	<ul style="list-style-type: none"> Statement of Commitment CS1.
11E	Seeks confirmation about the stormwater management system proposed for Googong Creek, specifically regarding the potential for turbidity to occur downstream during periods of high flow.	<p>The occurrence of increased turbidity in Googong Creek during periods of high flow is unlikely due to:</p> <ul style="list-style-type: none"> The stormwater management system has been designed to minimise the risk of environmental impacts downstream. The stormwater management system proposed for Googong Creek is likely to decrease the levels of turbidity, compared to the existing situation. Modelling also confirmed that the proposed water sensitive urban design measures contained as part of the stormwater management system would be very effective in reducing turbidity (total suspended solids). The stormwater management system has been designed in accordance with the relevant government and industry guidelines, which mandate that peak flows must be the same pre- and post-development. Therefore, periods of high flow (those most likely to result in erosion and turbidity) downstream of the site would be equivalent to the current situation. <p>Section 3.3 and Appendix D of this report discuss this in more detail.</p>	<ul style="list-style-type: none"> Section 3.3 of this report. Appendix D of this report. Appendix M of the EA.

ID	Comment	Response	Reference
Wickerslack Lane Resident #4			
12A	Seeks confirmation that any risks of emergency sewage overflows into the Queanbeyan River have been adequately considered and assessed.	<p>Environmental risk assessment was undertaken during the preparation of the EA and the approach and outcomes presented in Chapters 6 and 15 of the EA. The risk of an emergency sewage overflow into the Queanbeyan River was considered and detailed in Table 15.1 of the EA. Specifically, the risk rating of the "failure in treatment system, leading to overflow and reduced receiving water quality (quantity related)" was assessed as 'low' following the application of the management measures proposed. These are discussed below.</p> <p>This risk was considered during the design of the infrastructure for the WRP and the sewage pumping stations. The emergency management measures and storage of sewage flows during emergencies (such as power outages) have been designed at concept level at this stage as part of the Project, and would be developed further during detailed design. Appropriate guidelines from Water Services Australia have been used for this purpose. These are specified in Sections 5.3.2, 5.3.3 and 7.5.2 and in Section 6.7 of Appendix B of the EA.</p> <p>These emergency and storage management measures include:</p> <ul style="list-style-type: none"> • Ability to treat up to 3.5 times the average dry weather flows at the WRP. • Appropriately sized storages at sewage pumping stations and WRP. • Emergency generator connection points at the WRP and sewage pumping stations. • Space to install an additional storage tank at the WRP to contain (and then treat) additional flows if monitoring of the system indicates that it would be required. • Advanced monitoring and telemetry of the system. • Development of a Recycled Water Risk Management Plan, as part of the OEMP for the system. <p>In addition, the WRP has been designed to accommodate and includes an emergency bypass system with an emergency overflow facility that would, when the tank is full, discharge the overflow into the stormwater management system into the drainage reserve and which flows to Montgomery Creek and then to the Queanbeyan River. Given the measures outlined above, the operation of this emergency overflow facility is expected to operate only in worse case situations (eg extended power outages in periods of high flow and generators unable to be deployed).</p>	<ul style="list-style-type: none"> • Chapters 6 and 15 of the EA. • Sections 5.3.2, 5.3.3 and 7.5.2 of the EA. • Section 6.7 of Appendix B of the EA. • Statement of Commitments G8 and WQ4.

ID	Comment	Response	Reference
		<p>The proposed monitoring and adaptive management program (Statement of Commitments G8 and WQ4) during the construction and operation of the Project will help ensure water quality in the Queanbeyan River is maintained.</p> <p>It is concluded that the EA adequately considers and assesses emergency management and storage measures for the Project. Further, it is concluded that given these measures, there is a low risk of significant impacts.</p>	<ul style="list-style-type: none"> •
12B	<p>Seeks confirmation that the stormwater management system proposed for the Googong Creek catchment has been designed appropriately to consider a range of climatic variables and climate change, specifically regarding the potential for turbidity to occur downstream during periods of high flow.</p>	<p>The stormwater management system has been designed in accordance with the relevant government and industry guidelines, which mandate that peak flows must be the same pre- and post-development. Therefore, periods of high flow (those most likely to result in erosion and turbidity) downstream of the site would be equivalent to the current situation.</p> <p>Further, the design of the stormwater management system has been undertaken in accordance with relevant government and industry standards, which include potential changes due to climatic variance. The modelling used to develop the stormwater strategy uses a 40-years dataset and includes inherent consideration of potential variations in rainfall.</p> <p>Section 3.3 and Appendix D of this report provide further clarification from Brown Consulting that the design of the stormwater management strategy has considered the issues of climate change and the potential impacts on temperature, evaporation, soil moisture content, rainfall patterns during the hydrological modelling undertaken for the Project. As stated, in excess of 40 years of rainfall data as identified in the QCC stormwater design standards were used to assess the potential impact of climate change on the hydrological models. The approach undertaken for this strategy is in accordance with the current standards employed by the water industry and the Australian Institution of Engineers. This supports the information provided in Section 5.3 of Appendix A of Appendix M of the EA, which discusses the climate change considerations that were incorporated into the flow modelling undertaken for the stormwater management strategy.</p> <p>Refer to the response in ID 11E above for a discussion of the potential for turbidity to occur downstream during periods of high flow.</p> <p>Further details of the stormwater management system developed as part of the Project is provided in Section 3.3 of this report.</p>	<ul style="list-style-type: none"> • Section 3.3 of this report. • Appendix D of this report. • Section 5.3 of Appendix A of Appendix M of the EA. • ID 11E of this report.

ID	Comment	Response	Reference
12C	Proposes that further assessment of flows and water quality be undertaken prior to approval of the Project, rather than implementing the monitoring and adaptive management process proposed in the EA.	<p>The monitoring and adaptive management process proposed in the EA (and Statement of Commitment WQ4) is considered the most appropriate approach, due to:</p> <ul style="list-style-type: none"> • The staged nature of the Project, both in terms of: <ul style="list-style-type: none"> • Very low risk of any impacts during the early phases of the Project. • Ability to monitor early phases and modify subsequent stages of the Project. • The monitoring that would be undertaken at Googong Creek and the Queanbeyan River for at least 12 months before the commissioning of the WRP. • The need to collect data from the township once residents are present, to allow for calibration of the modelled development scenarios. This approach has been discussed at length with the relevant agencies. <p>Therefore, it is not considered that further assessment of flows and water quality would be beneficial at this time.</p>	<ul style="list-style-type: none"> • Statement of Commitment WQ4.
12D	<p>If the Project is approved by the DPI, proposes that:</p> <ul style="list-style-type: none"> • ACTEW consider the presence of the township in their management of flows released from Googong Dam. • Water quality monitoring is undertaken at the junction of Googong Creek and the Queanbeyan River. • QCC be responsible for notifying residents of any immediate health risks associated with using water from the river. • A source of potable water or rainwater be supplied to Wickerslack Lane residents who currently extract water from the Queanbeyan River. 	<ul style="list-style-type: none"> • As discussed at item ID 11D above, the proponent would consult with ACTEW and ActewAGL regarding environmental flows and management of Googong Dam releases. However, ultimately this is an issue for ACTEW Corporation and ActewAGL to address. • Water quality monitoring would be undertaken at the junction of Googong Creek and the Queanbeyan River (refer to the response at ID 6C above for details of the likely monitoring parameters). • During operation, QCC would be responsible for notifying residents of any health risks. • As discussed at item ID 11C above, the ambient water quality in the Queanbeyan River is required by the NSW Government to be maintained. Therefore, an additional source of potable water is not required for residents of Wickerslack Lane. 	<ul style="list-style-type: none"> • Statement of Commitments CS1 and WQ4. • ID 6C, ID 11C and ID 11D of this report.

3 Further clarifications

This chapter provides further clarifications on information regarding aquatic ecology and the stormwater management system, which was either not contained in the EA or was contained primarily in the appendices of the EA. This responds to requests for further information or clarification contained within several submissions received, in particular, Submissions 2 (Greater Southern Area Health Service), 3 (the Department of Trade and Investment, Regional Infrastructure and Services), 5, 6, 11, 12 (Wickerslack Lane residents) and 10 (NSW Office of Water).

3.1 Introduction

The information below is provided in response to submissions as they relate to the scope of the EA, as outlined in Section 2.2. It should be noted that some submissions received provided only general comments and recommendations that may not have been wholly related to the project that is the subject of the EA.

3.2 Aquatic ecology

3.2.1 Introduction and summary of the issue

A key issue raised in several submissions was a request for clarification of information regarding the existing ecological value of Queanbeyan River and Googong Creek (Submissions 2, 3, 5, 6, 10, 11 and 12).

It is noted that there is a lack of comprehensive historical monitoring data available from the existing Queanbeyan River monitoring stations and there is no historical data available for Googong Creek. This is, in part, due to Googong Creek being ephemeral. To supplement this lack of historical data, XP-Rafts modelling was undertaken to predict the likely flows Queanbeyan River and Googong Creek would experience under different weather and climatic conditions. This modelling was also required to assess the flow characteristics of the catchment noting that natural flows have been affected substantially over time due to the changes in land use to agricultural uses and impacts associated with Googong Dam and several farm dams.

The information contained in this section has been provided to clarify the data sets used, methodology and conclusions made from the aquatic ecology assessment that was undertaken as part of the EA. The purpose of providing this clarification is to further inform concerned residents and relevant government agencies that there has been adequate assessment of aquatic ecology at this stage of the Project and there are adequate mitigation measures in place to ensure there is no significant impact.

The information provided only relates to the water cycle project, which is the subject of the EA prepared under Part 3A of the EP&A Act, and does not include impacts of the stormwater system, which are subject to separate approvals under Part 4 of the EP&A Act.

A preliminary aquatic ecology assessment, conducted in 2008 by Ecowise Environmental, assessed the current status of ecological health in the Queanbeyan River and Googong Creek in the vicinity of the Project. From this, a number of conclusions and recommendations were made to shape the direction of the Project, ensuring the best environmental outcomes for the Queanbeyan River and Googong Creek.

3.2.2 Further information and data sets used

To clarify information regarding the existing ecological value of the Queanbeyan River and Googong Creek, this section will draw on additional information, including:

- The existing ACTEW operating licence and monitoring program, including the performance indicators for aquatic health assessment.
- XP-Rafts Modelling (Brown Consulting 2010).
- Findings of the aquatic health assessment for Queanbeyan River (Ecowise Environmental 2008).
- Physical aquatic habitat assessment for Queanbeyan River (Ecowise Environmental 2008).
- Physical aquatic habitat assessment for Googong Creek (Ecowise Environmental 2008).

3.2.3 Existing environment – Queanbeyan River

Context

The section of the Queanbeyan River that is being assessed flows north from Googong Reservoir to Queanbeyan. It is located to the east of the proposed Googong township. This is shown in Figure 3. The surrounding land use is principally agricultural.

The natural state of the Queanbeyan River has been altered by the damming at Googong Reservoir disrupting the natural flow regime, and the surrounding agricultural land uses impacting water quality.

Ecological health – Assessment methods

The main parameters monitored as *performance indicators* to assess the environmental flows and the impacts of water abstractions are:

- Fish ecology.
- Aquatic vegetation.
- Macro invertebrate ecology.
- Secondary production (this is the generation of biomass of consumer organisms in a system).
- Channel vegetation encroachment.
- Channel bed habitat.

Ecowise Environmental determined that macro-invertebrate ecology is the most appropriate indicator to measure ecological health for their 2008 assessment, as it is an accepted industry standard for measuring river health.

The observed/expected (O/E) ratio on macro-invertebrate composition and abundance is how this indicator is measured. It is assessed using the Rapid Bio-assessment protocols defined in the Australian River Assessment System (AusRivas), Sampling and Processing Manual (Nichols et al. 2000).

AusRivas is a rapid, standard method for assessing the ecological health of freshwaters through biological monitoring and habitat assessment. The AusRivas model predicts the fauna (macro invertebrates) expected to occur at a test site on the basis of its environmental attributes.

When a test site is sampled, the fauna observed are compared to the model's expectations for that habitat, and the resulting (O/E) score is regarded as an integrated indicator of river health.

The O/E score is used to categorise rivers into bands to measure the overall condition and severity of disturbance. The AusRivas O/E score is responsive to a variety of environmental effects, including water quality, habitat conditions, and changes in flow regime. Table 5 provides the AusRivas banding of ecological health of assessed sites on the basis of macro-invertebrate taxa collected.

Table 5 AusRivas banding scheme

Band	Description	O/E Taxa O/E	Taxa interpretations
X	More biologically diverse than Reference	O/E greater than 90th percentile of reference sites used to create the model. (> 1.12)	More families found than expected. Potential biodiversity 'hot-spot' or mild organic enrichment. Continuous irrigation flow in a normally intermittent stream.
A	Similar to Reference	O/E within range of central 80% of reference sites used to create the model. ($0.87 - 1.12$)	Expected number of families within the range found at 80% of the reference sites
B	Significantly Impaired	O/E below 10th percentile of reference sites used to create the model. Same width as Band A. ($0.63 - 0.87$)	Fewer families than expected. Potential impact either on water and/or habitat quality resulting in a loss of families.
C	Severely Impaired	O/E below Band B. Same width as band A. ($0.39 - 0.63$)	Many fewer families than expected. Loss of families from substantial impairment of expected biota caused by water and/or habitat quality.
D	Extremely Impaired	O/E below Band C down to zero. (< 0.39)	Few of the expected families and only the hardy, pollution tolerant families remain. Severe impairment.

Ecological health – ACTEW licence conditions

ACTEW Corporation is licensed by Environment ACT to '...take water from the Cotter River and Queanbeyan River catchments for the purposes of urban water supply to the residents of the ACT and Queanbeyan...' (Licence No. WU67, dated 10 December 2003).

ACTEW Corporation's annual Ecological Health Monitoring Program has the following objectives:

- To determine the effectiveness of the environmental flows and gather annual information; and
- To determine the impact of increases in water use from each of the water supply catchments covered by the Licence No. WU67.

The ACTEW Corporation monitoring program and assessment methodology interprets the AusRivas methodology discussed above, so that a more specific and relevant (but still consistent) assessment can be used for the Queanbeyan River below Googong Dam. Table 6 shows how the ACTEW Corporation Licence interprets the AusRivas methodology for this local purpose.

Table 6 AusRivas (macro invertebrate) based rating of Ecological Health, as presented in ACTEW Corporation Licence No. WU67

Rating	Observed/Expected (O/E) Ratio
Equivalent to reference condition	> 0.85
Slightly impaired compared to reference conditions	$0.6 - 0.85$
Moderately to highly impaired compared to reference condition	< 0.6

The short-to-medium term performance objective for the Queanbeyan River in the ACTEW Corporation Licence is not to impair the 'Ecological Health' from its current status.

The performance expectation of the river downstream of the Googong Reservoir is summarised in Table 7. The performance indicator descriptor of 'slightly to moderately impaired' noted in this table reflects that a AusRivas ecological health rating of 0.6 is on the boundary of 'slightly impaired' and 'moderately to highly impaired'. Hence, a range of 0.6 to 0.85 is appropriate to be described as 'slightly to moderately impaired'.

Table 7 Performance criteria for sampling sites used in the Environmental Flows Monitoring Program as defined in License WU67

Site code	Site location	AusRivas rating of Ecological Health	Performance indicator
QBN 704	1km downstream Googong Dam	0.6 – 0.85	Slightly to moderately impaired
QBN 703	Wickerslack Lane, downstream Googong Dam	0.6 – 0.85	Slightly to moderately impaired

Considering the above, it is most appropriate that monitoring of ecological health be consistent with the approach contained within Licence WU67 described above.

Ecological health – observations

The current ecological state of the Queanbeyan River is described in the ACTEW Corporation Licence as follows:

“...Macro invertebrate O/E ratios for all sites on Queanbeyan below Googong [dam] within 'slightly to moderately' impaired condition...” as described in Table 7, that is, an O/E ratio of 0.6-0.85.

This is consistent with results from the existing monitoring locations (as shown in Figure 3), namely, 1km downstream of Googong Dam (QBN 704) and the downstream stretch of the river (ie Wickerslack Lane, QBN 703). QBN 703 is located on the Queanbeyan River below its confluence with Googong Creek, which will receive discharges from the Project via the stormwater management system.

The collective results of several sampling events over the past few years, summarised in Table 8, shows that the QBN 704 and QBN 703 sites are recording 'A', 'B' and 'C' level AusRivas bands. Whilst a C banding would generally indicate that the river has been severely impaired, when the O/E results are compared to the Queanbeyan River's reference conditions outlined in the licence (Table 6 and Table 7) we note that the river generally falls into the 'slightly to moderately impaired' category.

Figure 3 Water quality monitoring sites on the Queanbeyan River

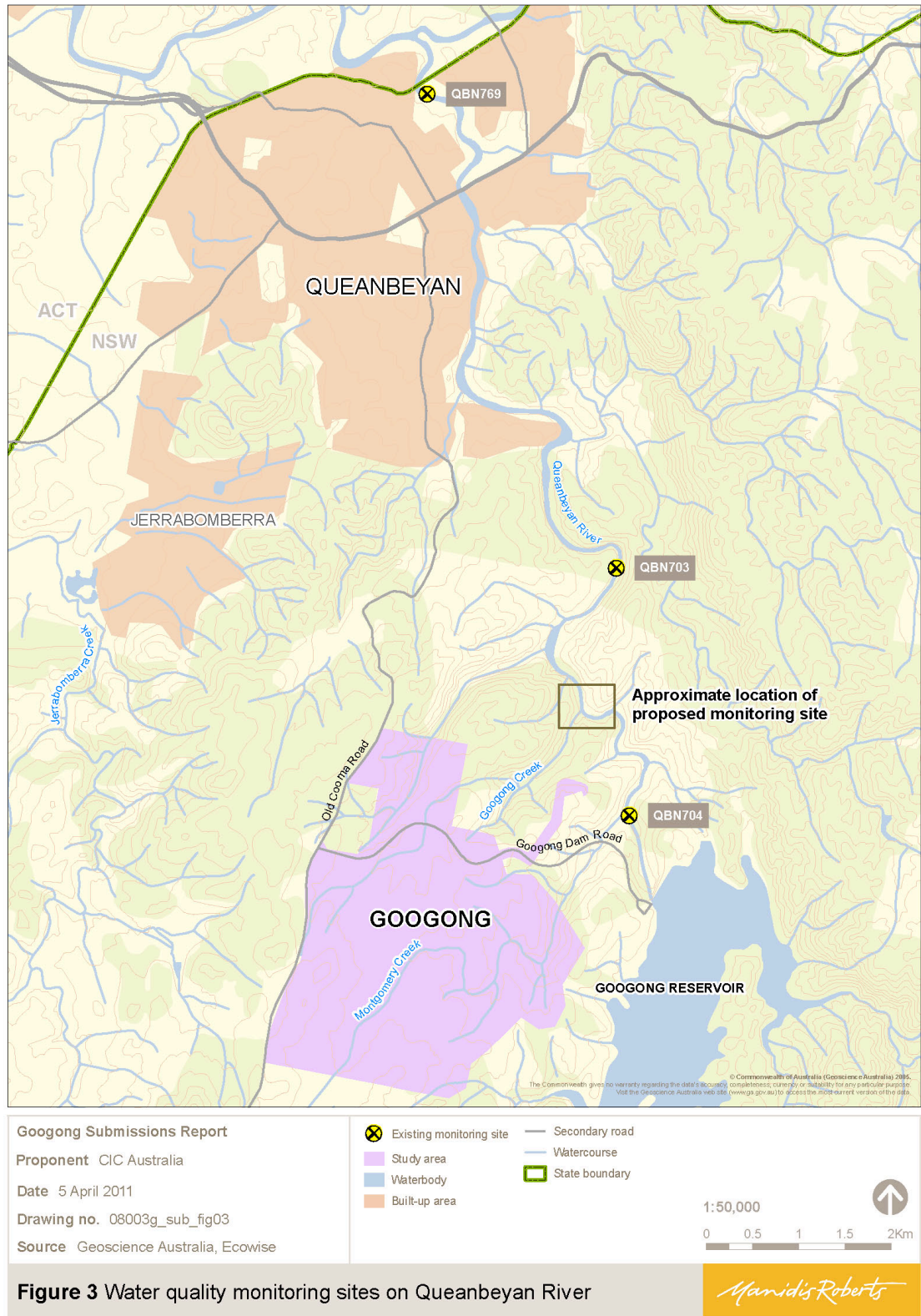


Table 8 Summary results of ecological health monitoring of relevant Queanbeyan River relevant to planning of future discharges upstream of Wickerslack Lane

Site code and location	Autumn 2003		Autumn 2004		Autumn 2005		Autumn 2006	
	O/E Ratio	AusRivas Band	O/E Ratio	AusRivas Band	O/E Ratio	AusRivas Band	O/E Ratio	AusRivas Band
QBN 704 Downstream Googong Dam	0.54	C	0.7	B	0.61	C	0.64	B
QBN 703 Wickerslack Lane	OEM	–	OEM	–	1.03	A	0.96	A

OEM – Outside the experience model. In 2003 and 2004 the data collected regarding the sampling site did not allow a reference site to be selected from the AusRivas model for comparison with the observed data.

Physical aquatic habitat assessment – assessment methods

The AusRivas ecological health monitoring also requires a 'Physical Habitat Assessment' to be conducted, which takes into consideration other site characteristics that indicate 'ecological health'. This assessment examines several key indicators for riverine health including:

- Riparian vegetation, including bank width.
- Vegetation type and percentage of cover.
- Presence of macrophytes.

Physical aquatic habitat assessment – observations

The key results of the physical aquatic habitat assessment are summarised in Table 9.

These results in Table 9 are indicative of relatively healthy macrophytes and native tree cover both upstream and downstream of the confluence of Googong Creek and the Queanbeyan River.

Table 9 Status of Riparian vegetation at Queanbeyan River Sites

	2005	2006	2005	2006
	QBN 704 (1km downstream Googong Dam)	QBN 704 (1km downstream Googong Dam)	QBN 703 (Wickerslack Lane, downstream Googong Dam)	QBN 703 (Wickerslack Lane, downstream Googong Dam)
Riparian vegetation				
Left bank width (m)	3	20	10	20
Right bank width (m)	10	15	2	5
Vegetation type % cover of riparian zone				
Trees (>10M)	10	5	10	10
Trees (<10M)	40	35	85	60
Shrubs	5	10	5	40
Grasses/Ferns/Sedges	60	40	40	40
Shading of river %	6-25	6-25	6-25	6-25
Native vegetation %	60	75	90	90

	2005	2006	2005	2006
	QBN 704 (1km downstream Googong Dam)	QBN 704 (1km downstream Googong Dam)	QBN 703 (Wickerslack Lane, downstream Googong Dam)	QBN 703 (Wickerslack Lane, downstream Googong Dam)
Bare ground above water mark, left bank %	40	10	10	5
Bare ground above water mark, right bank %	40	30	5	10
% Reach covered by				
Periphyton %	<10	35-65	<10	<10
Moss %	<10	<10	<10	<10
Filamentous algae %	<10	<10	<10	<10
Macrophytes %	65 – 90	65 – 95	<10	<10
Macrophytes				
Submerged/floating	<i>Potamogeton</i>	<i>Potamogeton</i>	–	–
Emergent (genus)	<i>Typha</i>	<i>Elocharis, Juncus, Typha</i>	<i>Cyperus, Juncus, Typha, Schaenoplectus</i>	<i>Cyperus, Typha, Persicaria</i>

Although this information is somewhat variable and dependent on 'site-specific' features (pool and riffle zones, sand bars, etc.), they provide some indication of health and are useful as 'baseline' measurements for any future monitoring of potential impacts of the discharges to the Queanbeyan River at the proposed site.

Conclusions

The observations above indicate that whilst river health and habitat has been improving, the river is still being impacted by agricultural and water storage activities in the catchment. As such, it is considered that the river is still 'impaired' near the proposed monitoring site (at the confluence of Googong Creek and the Queanbeyan River).

3.2.4 Existing environment – Googong Creek

Context

Googong Creek is an ephemeral creek located approximately four (4) kilometres south of Queanbeyan. It flows through agricultural land and discharges into the Queanbeyan River approximately two (2) kilometres north of the Googong Reservoir.

The surrounding agricultural land use and the damming on agricultural land has altered the creek's natural flow regime and aquatic ecology.

Ecological health – assessment methods

There is no historical data on which to base the ecological health assessment of Googong Creek. As the creek is ephemeral in nature, this limited the ability to collect meaningful data in the short term. Therefore, theoretical modelling using XP-Rafts software was considered appropriate. The XP-Rafts model was used for hydrological analysis of the existing catchment to obtain pre-development flows and to model various potential development scenarios. The model integrates the various stormwater detention basins proposed for the township. Appendix D discusses the basis for stormwater modelling.

Ecological health – modelling outcomes

The modelling confirmed that Googong Creek is naturally ephemeral. The modelling cannot completely account for all elements of the existing situation, most notably the intermittent damming by farmers of the creek. This damming has further affected the natural flow regime that would have been present prior to settlement.

As shown in Table 7.4 of the EA, the annual flows of Googong Creek at Googong Dam Road and at the confluence of with the Queanbeyan River are modelled to be 179 and 329 ML/year. Section 7.5.4 of the EA provides more detail of the modelled existing flow regimes of Googong Creek, including seasonal variation. For example, existing flows in Googong Creek average (50th percentile) 14.46 to 15.55 kL/day in summer and autumn, whereas in winter and spring, the averages are 28.51 to 32.83 kL/day (refer to Table 7.8 of the EA). In comparison, these flows are substantially lower than the Queanbeyan River, which averages 4,700 to 15,000 kL/day (refer to Table 7.9 of the EA).

Overall, due to the ephemeral nature of Googong Creek, the agricultural land use of the catchment, damming of the drainage lines and other land use impacts, the ecological health of Googong Creek is concluded to be somewhat degraded.

Physical aquatic habitat assessment – assessment methods

The main assessment method for the physical environment of Googong Creek was a desktop review of ecological literature for the area. This included:

- Environmental Assessment – Googong Urban Investigation Area (2004) – conducted by the Johnstone Centre, Charles Sturt University for Willana Associates.
- State of the Environment Report of Queanbeyan City Council (2005-2006).
- Think Water, Act Water – Volume 3: State of the ACT's water resources and catchments (2004), Environment ACT, Department of Urban Services.
- Cotter Environmental Flows Program – Macro-invertebrate Monitoring, Seasonal Reports 2004-2006 conducted by Ecowise Environmental for ActewAGL.
- Various publications and documents available on QCC website (www.qcc.nsw.gov.au) and Murrumbidgee Catchment Management Authority (CMA) website (www.murrumbidgee.cma.nsw.gov.au).
- Extractions of analytical data for water quality monitoring of selected sites undertaken for ACTEW and the ACT government.

Ecowise Environmental also undertook a site inspection on the 15 April 2008 to ground truth the findings of the desktop literature review. Googong Creek was assessed by a walk-through survey covering the distance from the Googong Dam Road to the confluence the Queanbeyan River.

Physical aquatic habitat assessment – observations

The physical habitat assessment of Googong Creek revealed that the creek's most upstream section gently slopes to a previously constructed farm dam, which has a reasonably intact earthen bund. The landscape abutting these upstream sections of the creek continues to gently slope within the first 300m of the creek, before the creek narrows into a series of sharply winding gullies, which head down to the river.

At the time of inspection the entire length of the creek was dry. Given the steep gradient in the creek, from the top most section at the Googong Dam Road down to the Queanbeyan River, flows in the creek during wet weather could be expected to be fast. The formation of deeply incised channel and gullies along the length supports this conclusion.

Whilst there are a small number of native trees, the majority of the vegetation in the area is degraded grassland. In the long, middle gully sections of the creek, there are stretches of varying length, which are moderately weed infested. Many areas have dense growth of various native scrub.

Human caused disturbances, such as construction of access tracks, movement of vehicles and dumping of litter and rubbish appear to be having on-going impacts on the area. There are areas where litter and rubbish has been dumped in sections associated with the creek, as well as on the upper riparian areas.

The understorey native vegetation in the middle sections of the terrain is dominated by Burgan (*Kunzea ericoides*), which overhangs the creek bed in many stretches.

The downstream vegetation of the creek varies from relatively undisturbed native bushland and vegetation communities to well-maintained access tracks in the lower-middle section of the creek.

The topography in the area is variable, with steep gullies and evidence of erosion in some areas and gentle slopes and flat ground in others. Those areas experiencing erosion may require stabilisation and fortification by rock batter if monitoring identifies that such measures are required.

Conclusions

The observations above indicate that the health and physical habitat of the ephemeral Googong Creek has been impacted by agricultural activities over a long period of time. Regular flow regimes have been disrupted by damming and agricultural runoff has likely impacted the water quality. As such, it is considered that the creek is 'impaired'.

3.2.5 Likely impacts of the Project

Construction impacts

The potential impacts on surface water quality, flow regimes or to the aquatic health of Googong Creek and Queanbeyan River due to the construction of the Project are assessed in Sections 7.4 and 11.2.3 of the EA. The direct impacts principally related to civil works and include:

- Laying pipelines across or near watercourses, specifically trenching, vegetation clearing and the stockpiling of excavated (spoil) material. These activities have the potential to impact on water quality due to:
 - The transferring increased quantities of fine sediment to receiving streams, which may interfere with the gill function of fish and filter feeding organisms.
 - A reduction in the euphotic zone and retardation of aquatic plant function.
 - Increased turbidity, which interferes with visual feeding.
 - Siltation and a reduction in stream habitat and removal of water sources for riparian fauna.
 - Increased nutrient loads, causing algal blooms.
- Vegetation clearance and soil disturbance. Changes in the waterway channel or bank form may result from loss of riparian vegetation and leave to increased erosion potential or geomorphological impacts. This would be evident in areas of good, intact native vegetation. This would also be dependent on the bank and stream bed material, flow velocity and the existing vegetation and also the proximity of construction activities to waterways.
- Accidental spills of fuels and chemicals. The pollution of streams with fuel or chemicals used during construction activities can affect aquatic ecology should the spills reach water bodies via run off. Depending on the severity of the spill, these have the potential to have acute effects or longer term, chronic effects on aquatic environments.

Indirect impacts could also occur due to run-off and soil erosion if appropriate sediment and erosion control measures are not implemented.

Operational impacts

The potential operational impacts of the Project on aquatic ecology are assessed in Section 11.2.4 of the EA. The potential operational impacts on the aquatic environments of Googong Creek and the Queanbeyan River identified were:

- Impacts of any changes in flow regimes on aquatic flora and fauna.
- Impacts of any changes in water quality on aquatic flora and fauna.
- The potential for weeds to spread downstream.

3.2.6 Proposed management measures

To ensure that this project does not significantly impact the aquatic ecology of the Queanbeyan River and Googong Creek during construction or operation, a range of mitigation measures are proposed. These include:

- Soil and water management plans, to be developed and implemented for the construction phase (including sediment and erosion control measures).
- Spill management and response procedures will be developed in the CEMP for the construction phase of the Project.
- The CEMP will incorporate measures to ensure that any creek banks affected by construction are stabilised.
- The OEMP will outline erosion and sediment control measures to protect buffer and riparian vegetation zones.
- Ongoing monitoring of downstream environment.

In addition, the stormwater management system is designed to minimise downstream environmental impacts (see Section 3.3 and Appendix D of this report). This includes ensuring that flow regimes, particularly peak flows, mimic the existing situation, as required by QCC. This will be achieved through regulating flows particularly at Basin 1 (refer to Figure 4 of this report), immediately south of Googong Dam Road, ensuring there are times of no-flow (as is currently experienced).

3.2.7 Monitoring program and adaptive management

Further to the above management measures a monitoring and adaptive management regime is proposed. A water quality and aquatic ecology monitoring program to monitor Googong Creek and the Queanbeyan River will be established prior to construction, and will be maintained throughout construction and operation to ensure that the existing ecological health of both watercourses is maintained. Statement of Commitments OP1 and WQ4 relate to this monitoring program. Staging of the Project and the township as a whole allows for adaptive management of relevant aspects of the system depending on the outcomes of monitoring throughout the early years of the township.

3.2.8 Conclusion

The ecological assessments carried out to date indicate that the Queanbeyan River and Googong Creek catchments have been somewhat impacted by past human activities, with the ecological state being slightly to moderately impaired when compared with the reference condition. This has been attributed to agricultural activities and, in the case of Googong Creek, intermittent damming along the length of the

creek. It is concluded that the project will be unlikely to result in significant impacts to the aquatic ecology of Googong Creek or the Queanbeyan River.

3.3 Stormwater management system

3.3.1 Background

Brown Consulting was engaged by CIC to provide a design report for the stormwater drainage and management of the Googong township (Neighbourhood 1A: Stages 1 and 2). The report was prepared to support the development application (under Part 4 of the EP&A Act) for the development of Stages 1 and 2 (337 dwellings) of Neighbourhood 1A (1,228 dwellings).

3.3.2 The purpose of the stormwater management system

The stormwater management system is an important link between the Project and the township as a whole, so that the most efficient and effective system can be formed. It seeks to achieve the best possible outcomes for the environment, protecting downstream receiving waters from water quality degradation and flooding. It has been designed to meet stormwater targets identified within the Queanbeyan Development Control Plans for both water quality and quantity.

3.3.3 Summary of the proposed stormwater management system within the Googong Creek catchment

The stormwater management strategy provides for specific measures within the catchment area of Googong Creek to ensure that flow and water quality objectives are achieved. Figure 7.2 of the EA shows the extent of Googong Creek catchment within the study area.

The stormwater detention and peak flow attenuation strategy has been developed through a series of models undertaken by Brown Consulting (Appendix A of Appendix M of the EA). Key elements of the strategy include (see Figure 4 of this report):

- Basin 1 (Local park 1): Is central to Neighbourhood 1A of the Googong township, achieving a number of essential functions (stormwater detention basin, stormwater quality control and improvement site, urban park, recreational functions, environmental and biodiversity values conservation, and significant amenity value for the whole area).
- Basin 2: this sporting oval/recreational reserve also represents a major stormwater detention basin, which attenuates flow from a large part of the Googong catchment.
- Basin 3 and 4: will be designed to provide significant attenuation of the peak flows generated by the northern part of the Googong Creek Catchment (part of Neighbourhood 2).
- A network of stormwater drainage providing stormwater attenuation benefits.

The locations of these basins are shown in Figure 4 of this report, which also shows the approximate location of discharge of excess recycled water into the stormwater management system.

In addition to the key basins discussed above, measures to be implemented in the strategy include minor and major flow management methods, gross pollutant traps, swales, bioretention basins, raingardens, and soil erosion control measures. These measures will treat stormwater and assist in regulating flows.

3.3.4 Recycled water in the stormwater management system

High quality excess recycled water would be released into the stormwater management system upstream of Basin 4 (refer to Figure 4 of this report). The Stormwater Management Strategy has considered the release of excess recycled water into the system in a similar way as it considers the flow and water quality of other input into the catchment from upstream and offsite on the western side of Old Cooma Road (ie as part of the overall management of the system). This has been determined as the most efficient and effective method to achieve high environmental outcomes of water quality and stream health. It should be noted that the recycled water that will be discharged is treated to be suitable for non-potable uses and human contact. However, as requested by the OEH, it would not be chlorinated (refer to Section 4.2 of this report).

Section 7.5.4 of the EA discusses the proportion of recycled water in relation to the total stormwater flows at various times of the year, based on the stormwater modelling discussed in Appendix D of this report. As rainfall and the demand for recycled water varies substantially throughout the year, the proportion of excess recycled water discharged into the stormwater management system is consequentially varied, as shown in Figure 7.5 of the EA.

3.3.5 The stormwater management system (in relation to Part 3A and Part 4)

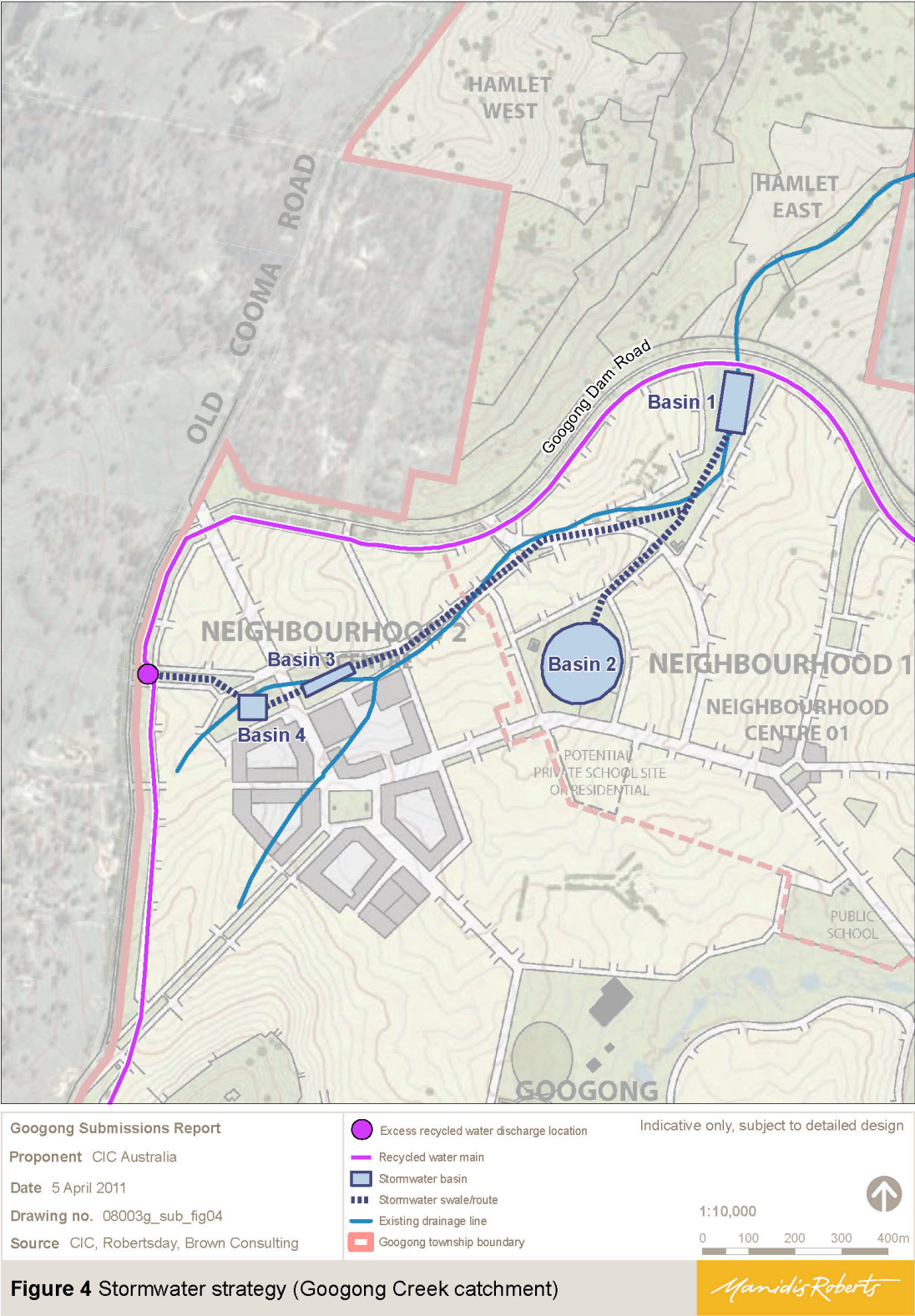
Release of excess recycled water and the impacts thereof are included as part of the Part 3A application and have been considered in the EA for the Project.

The management and mitigation measures proposed for the management of flows and water quality in stormwater (which includes the excess recycled water) are stormwater management measures (including water sensitive urban design), and as such approval for these water sensitive urban design components is part of a separate development application (under Part 4 of the EP&A Act).

In summary, the potential impacts of the discharge of excess recycled water are managed and mitigated through the combination of:

- The treatment measures in the WRP and the use of recycled water throughout the township (assessed under Part 3A).
- The treatment and flow control measures in the stormwater management system (assessed under Part 4). For further information, please refer to Appendix D of this report.

Figure 4 Basin locations



3.3.6 Conclusion

As discussed in Appendix D, the stormwater management system designed by Brown Consulting meets the requirements of the NSW Government and QCC by:

- Ensuring that post-development peak flows mimic pre-development peak flows.
- Ensuring that; through managing nutrients, pollutants and flows, downstream environments are not adversely affected by the development of the township.

The discharge of excess recycled water into the stormwater management system at the most practical upstream location within the township is in accordance with NSW Government guidelines and policies. This excess recycled water would be of the same very high quality that will be used by residents throughout the township as an unrestricted non-potable domestic water source (noting that discharged recycled water would not be chlorinated).

Modelling of the proposed stormwater management system has taken into account the water quality and flow characteristics of the excess recycled water that would be discharged into the system. This modelling has shown that the stormwater management system will adequately manage both the inputs from the township and the discharge of excess recycled water.

The proposed stormwater management system, combined with the water quality discharge requirements for the recycled water, will ensure that the water quality within the Queanbeyan River during operation of the Project will meet the ambient water quality in the river, as required by the NSW government.

Therefore, it is concluded that no detrimental downstream environmental or human health impacts would result from the discharge of excess recycled water into the stormwater management system. As a result, and as detailed in Sections 2.4 and 2.5 of this report (refer to the response provided in ID 11D), the Project would not affect the users of the Queanbeyan River, in particular, those users who exercise riparian rights to extract of water from the river for domestic and stock purposes.

4 Refinements to the Project – Preferred project report

This chapter provides information regarding the minor refinements to the Project, as well as providing further detail of the management and mitigation measures in place to ensure environmental impacts are minimised. It represents the preferred project report for the Project.

4.1 Minor refinements to the Project

Minor amendments and refinements of the Project have been made in response to several submissions and following discussion and agreement between CIC and the interested parties. These refinements are:

- Relocation of the bulk water pumping station and associated infrastructure. This responds to Submission 7 (ActewAGL) and other consultation undertaken with ACTEW Corporation, ActewAGL and QCC. This refinement has been agreed by CIC to address operational issues related to the ACTEW Googong Water Treatment Plant.
- Potential alterations to the WRP as a result of revised discharge limits. This responds to Submission 8 (OEH).
- The inclusion of an *Aprasia* Conservation Area, responding to Submissions 4 (ACT Department of Environment, Climate Change, Energy and Water) and 8 (OEH). This change could allow the relocation of a pumping station during the detailed design for engineering purposed, if required.

It is noted that these refinements to the Project have not been proposed to minimise the environmental impact of the Project. As described below, they are generally consistent with the Project described in the EA and will not materially change the environmental impacts predicted for the Project in the EA.

The following sections provide further detailed information on the refinements made to the Project and consider changes to the predicted environmental impacts and mitigation measures from those described in the EA.

4.2 Bulk water pumping station and associated infrastructure

4.2.1 Introduction

The bulk water pumping station (BWPS) and associated pipelines are essential water supply infrastructure for the Googong township. Potable water will be supplied to Googong from the existing water supply for the ACT and Queanbeyan, which is managed primarily by ACTEW Corporation. The design of the BWPS, associated access road and rising mains, staging and other details are provided in Section 5.3.1 of the EA and Sections 3.2, 3.3 and 3.4 of the MWH Concept Design Report (Appendix B of the EA). As a result of submissions and the recommendations discussed below, it is proposed to alter

the location of the BWPS and associated infrastructure. No other changes to the potable water system are proposed.

4.2.2 ACTEW Corporation and ActewAGL recommendations

Through ongoing consultation with ACTEW Corporation, ActewAGL and QCC it was recommended that:

- The potable water pipelines (rising mains) connecting the BWPS to the Googong township should not traverse the existing ACTEW Googong Water Treatment Plant. This was to allow for further flexibility in any future upgrades of the water treatment plant.
- The potable water pipelines not traverse the existing ACTEW Corporation 1800mm diameter bulk water pipeline for operational reasons.

4.2.3 Revised location of the bulk water pumping station, access and pipelines

As a result of the first recommendation noted above in Section 4.2.2, it was determined that the optimal route for the potable water pipelines and access would be to the west of the existing Googong water treatment plant. This access route could, as much as practical, utilise an existing access track and disturbed area. Therefore, and considering the second recommendation, the BWPS should be moved from the eastern to the western side of the existing 1800mm diameter bulk water pipeline. This represents a move of approximately 50 metres to the west. Figure 5 of this report shows the revised infrastructure locations (blue), in comparison to those shown in the EA (pink).

The relocated BPWS and associated infrastructure is situated the same parcel of land (Lot 7, DP 592796) within the Googong Dam and Foreshores Area. The ownership of the site remains with the Commonwealth Department of Finance and Deregulation. Consultation with the Department has been undertaken in relation to the revised location of the BPWS and associated infrastructure. The Department is also a member of the Googong township-interface working group (refer to Section 1.6.4 of this report).

4.2.4 Comparative assessment of the environmental impacts of the original and the amended location of the bulk water pumping station

Within the context of the entire Project, the relocation of the BWPS and the associated infrastructure is considered to be a minor refinement to the Project. Nonetheless, Table 10 of this report has been prepared to provide a comparison of the environmental impacts associated with the changes to the location of the BWPS site and associated infrastructure. The table assesses each environmental aspect listed in Table 15.1 of the EA, which the residual environmental risk assessment for the Project. Of the environmental aspects assessed, the construction of the relocated BPWS and associated infrastructure has the potential to impact on terrestrial ecology in areas of not previously surveyed as part of the assessments undertaken during the preparation of the EA.

A terrestrial ecological assessment was undertaken in late 2010 by Biosis Research to determine the potential impacts of the relocation of the BWPS and associated infrastructure on terrestrial ecology. Further details are provided in Section 4.2.5 and a copy of the report is provided in Appendix A.

Figure 5 BWPS site – amended location



Table 10 Potential changes to environmental impacts due to relocation of bulk water pumping station (BPWS) and associated infrastructure

Environmental aspect	Potential change in environmental impact	Requirement for further assessment
Water quality	Impacts on surface water quality during the construction of the relocated BPWS and associated infrastructure (sediment runoff, chemical spills, etc) will be managed under the CEMP. The relocation is in similar terrain and any impacts are expected to be of a similar nature and intensity. There will be no changes to impacts of the Project on water quality during operation, as the BPWS operation will not change.	None
Hydrology	No changes to impacts on flows in receiving waters, the geomorphology of the beds of waterways and groundwater flows are expected due to the construction and operation of the relocated BPWS and associated infrastructure.	None
Heritage	Navin Officer Heritage Consultants surveyed and assessed the Googong Township area and the Project as part of the cultural heritage studies undertaken in 2003 for the Googong local environment study (LES) and in 2009 as part of the EA (Appendix G). The four (4) Aboriginal heritage sites identified in the vicinity of the Project during the latter study were considered to be of low significance and it was recommended that they be managed by re-positioning these artefacts if impacts were anticipated during construction. The BPWS and associated infrastructure will now be located in disturbed areas and access tracks on the other side of the existing Googong water treatment plant pipeline, within the same parcel of land. Disturbance occurred during the construction of the Googong water treatment plant and associated infrastructure, and the access tracks are subject to ongoing use relating to the management of the Googong Dam and its foreshores. Although no site-specific survey of these disturbed areas has been undertaken, the same management measures are proposed to be undertaken in the event that heritage items are discovered during the construction of the BWPS and associated infrastructure. Therefore, no change in the predicted impacts is expected. Impacts on unknown heritage items that are discovered during construction will be managed under the CEMP.	None
Geology and soils	Impacts on soil stability, soil erosion and soil contamination are expected to be of a similar for the relocated BWPS and associated infrastructure. The relocation is in similar terrain and the same soils landscapes (ie Round Hill, Anembo and Burra – see Table 9.1 of the EA). These soils are generally acidic, low fertility and have low water-holding capacity. Therefore, any impacts are expected to be of a similar nature and intensity. Any potential impacts will continue to be managed under the measures to be provided in the CEMP and OEMP.	None

Environmental aspect	Potential change in environmental impact	Requirement for further assessment
Air quality	<p>Potential dust generation during the construction of the relocated BPWS and associated infrastructure will continue to be managed under the CEMP. The relocation is in similar terrain and any impacts are expected to be of a similar nature and intensity.</p> <p>The operation of the relocated of the BPWS and associated infrastructure will not change the predicted impacts regarding greenhouse gases and odours.</p>	None
Ecology	<p>The construction of the relocated BPWS and associated infrastructure has the potential to impact on terrestrial flora and fauna inhabiting areas not surveyed in detail previously.</p> <p>The operation of the relocated BPWS and associated infrastructure will not change the predicted biodiversity impacts.</p>	Assessment of potential impacts on terrestrial ecology
Traffic and access	As the access road to the BPWS is now planned to be separate from the access road to the ACTEW Corporation's Googong Water Treatment Plant, interaction of vehicles on the existing access road during construction and operation will be reduced. Otherwise the relocated pumping station and associated infrastructure is not expected to change predicted traffic and access impacts.	None
Visual amenity and landscape/urban design	The relocated BPWS and associated infrastructure would not be visible from Googong Dam Road so no change to the impacts on visual amenity is expected. Rehabilitation of the pipeline post-construction would be undertaken in conjunction with the final construction of the all weather access road.	None
Noise and vibration	<p>The noise and vibration impacts during construction and operation are expected to be similar for the relocated BPWS and associated infrastructure.</p> <p>The change in the distance to the nearest sensitive receiver (ie the 'Talpa' residence) due to the relocation of the BWPS has been marginal. The new location is approximately 50 metres closer to the residence, but still in excess of 600 metres away. The other sensitive receivers identified remain over 1 kilometre from the BWPS. No additional receivers have been identified due to the relocation.</p> <p>The temporary noise and vibration impacts during construction of the BPWS and associated infrastructure will be similar to that assessed in Section 13.4.4 of the EA. The noise impacts from the construction activities were predicted to exceed the guideline levels and are still predicted to exceed these levels. These impacts will be managed under the measures to be provided in the CEMP.</p> <p>During operations, the 600 metre distance between the BPWS and the nearest residence will be maintained. This will ensure that the noise and vibration impacts during operation of the relocated BPWS and associated infrastructure are consistent to those described in Section 13.4.5 of the EA. Any potential impacts will continue to be managed under the measures to be provided in the OEMP.</p>	None

Environmental aspect	Potential change in environmental impact	Requirement for further assessment
Utilities and services	<p>The BPWS and associated infrastructure have been relocated to avoid the existing ACTEW infrastructure associated with the Googong water treatment plant. Any future interactions have, therefore, been avoided and therefore potential impacts have been reduced. These potential impacts are:</p> <ul style="list-style-type: none"> • Limitation of potential future augmentation or upgrade of the plant. • Restriction of access to the infrastructure (in particular the existing bulk water pipeline) for operations and maintenance purposes. 	None
Waste	Waste generated during the construction and operation of the relocated BPWS and associated infrastructure are not expected to be materially different. Waste generated will continue to be managed under the CEMP and OEMP.	None
Socio-economic	Impacts on recreational use of nearby sites during construction and operation are expected to be similar for the relocated BPWS and associated infrastructure. The BPWS and associated infrastructure will still be located away from these sites.	None
Hazards and risk (including human health)	<p>The hazards and risks due to the construction of the BPWS and associated infrastructure (eg trench collapse, traffic, bushfire, personal safety and security) will not be materially different due to the relocation and will be managed under the CEMP. Risk associated with working in close proximity to ACTEW assets have been reduced due to the relocation.</p> <p>The hazards and risks due to the operation of the BPWS and associated infrastructure will not change due to its relocation and the operation will not change.</p>	None

4.2.5 Ecological assessment of the revised design

In early 2011, CIC commissioned an ecological assessment of the revised location of the BWPS and associated infrastructure. Biosis Research undertook this assessment in January and February 2011, and their report can be found in full in Appendix A.

The Biosis assessment found that the area is highly disturbed, with a high number of weed species. This disturbance is primarily associated with the construction of the ACTEW Googong water treatment plant, associated infrastructure and access tracks.

Nevertheless, ecological features identified during surveys were:

- Hollow-bearing trees, which provide habitat for native fauna species.
- Threatened fauna species – a bird, the Speckled Warbler (*Chtonocola sagittata*) and a micro-bat, the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*). While both of these species may use this site from time to time, the site does not contain important habitat features for either species.
- A small area (1,210m²) classified as a listed ecological community. While technically meeting the criteria for this community, this patch is isolated and within a disturbed landscape.

As a result, assessments of significance for the above and for other relevant species were undertaken in accordance with the NSW *Threatened Species Conservation Act 1995* and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*. These assessments considered that:

- Appropriate management and mitigation measures contained within the Part 3A EA were applicable and would generally avoid any impacts on the ecological features of the site. These measures would be detailed in the CEMP for the Project and would include:
 - Hollow-bearing tree removal guidelines.
 - Erosion, sedimentation and stormwater management controls.
 - Implementation of exclusion zones prior to construction.
 - Weed control and management measures.
- No new Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) individuals or populations were found, and the proposed altered location of the access road is located further from the previously identified populations of the species.
- The alignment of the potable water pipelines and access road is flexible and would be designed to avoid the listed ecological community and avoid the removal of most of the identified hollow bearing trees.

The Biosis Research assessment concluded that:

- There would be no impacts upon threatened species or communities as a result of the construction or operation of the Project.
- Appropriate avoidance, management and mitigation measures as proposed in the EA and this submissions report should be implemented.
- No further assessment or referral under the EPBC Act is required.

4.2.6 Conclusion

The location of the BWPS and associated infrastructure, which has been altered due to the operational requirements of the ACTEW Googong Water Treatment Plant, is generally consistent with the design as originally proposed in the Part 3A EA. Within the context of the entire Project, this change is considered to be minimal. The revised location would not result in any materially different environmental impacts, although the infrastructure would be located further away from previously identified Hoary Sunray populations. The amended location responds to Submission 7 (ActewAGL) and further consultation with ACTEW Corporation, ActewAGL and QCC.

4.3 Changes related to proposed discharge limits

This section discusses the likely changes to the water treatment process and related infrastructure expected as a result of OEH's recommended discharge limits (refer to Submission 8). MWH has produced a technical memorandum (Appendix B of this report) that concludes all discharge conditions proposed by OEH are achievable by the treatment process within the WRP. The potential minor changes to infrastructure as a result are discussed in Section 4.2.2.

4.3.1 Office of Environment and Heritage recommendations

The OEH's recommendations for final effluent quality are slightly different to those suggested in the EA and are outlined in Table 11 below.

Table 11 Discharge limits proposed by OEH (Submission 8)

Parameter	OEH proposed discharge limits to environment (90 th percentile)	Proponent's proposed limit (90 th percentile) from Table 5.8 of the EA
Biological oxygen demand	10 mg/L	10 mg/L
Suspended solids	10 mg/L	20 mg/L
Total nitrogen	10 mg/L	15 mg/L
Total phosphorus	0.5 mg/L	0.5 mg/L
Total dissolved solids (salts)	700 mg/L	700 mg/L
Faecal Coliforms	200 cfu/100mL	No limit proposed
pH	6.5-8.5	No limit proposed
Free Chlorine (residual)	0.1 mg/L	No limit proposed
Nitrogen – Ammonia	2 mg/L	No limit proposed
Oil and Grease	2 mg/L	No limit proposed

4.3.2 Changes to infrastructure

As a result of the changes to water quality parameters documented above, two minor changes to the water cycle infrastructure would be required:

- Minor amendments to the WRP treatment process during operation.
- De-chlorination of excess recycled water prior to discharge.

Minor amendments to the WRP process

For total nitrogen (TN), the following minor amendments to the WRP, which would be considered during the detailed design of the plant, would ensure that the treatment system achieves the recommended discharge parameters:

- Ensuring that experienced operational staff are trained and engaged to achieving the minimum possible output TN concentration.
- In order to improve the TN performance, higher levels of 'carbon dosing' may be required. This additional carbon will enter the system as acetic acid dosing.

This change in the operation of the WRP would not result in materially different environmental impacts. The frequency of chemical deliveries to the plant may increase slightly, but this is the only change to the environmental impacts predicted in the EA.

De-chlorination of excess recycled water

The environmental water release strategy must be reviewed during detailed design in order to achieve the OEH recommendation of 0.1mg/L free chlorine residual. Two options would be considered:

- De-chlorination using sodium bisulphite. This option would involve the design and construction of a chemical dosing facility at the excess recycled water discharge location (at or upstream of stormwater Basin 4 – refer to Figure 4 of this report).
- Removal of the chlorination stage of the treatment process for the excess recycled water discharge. For this option, the treatment may be split to two streams at the final stage, one for the recycled water system (with chlorination), and the other for environmental releases (with the chlorination stage

removed). This approach will require the physical separation of flows by constructing a second pipeline between the WRP and the discharge location.

At this stage, both options are considered feasible and neither represents a major change to the Project. The final option would be selected during detailed design. The environmental impacts of both options are not expected to be materially different from those assessed in the EA for the Project. In both cases additional infrastructure would be provided in locations already proposed to be occupied by water cycle infrastructure associated with the Project.

4.3.3 Conclusion

The water quality parameters proposed by OEH in Submission 8 are achievable with only minor alterations to the proposed water cycle infrastructure, as discussed above. It is recommended that the OEH water quality parameters noted in Table 11 of this report be adopted in the environmental protection licence for the Project. These project refinements are not expected to materially change the environmental impacts of the Project predicted in the EA.

4.4 *Aprasia* conservation area

4.4.1 Background

The threatened species, Pink-tailed Worm Lizard (*Aprasia parapulchella*), was identified in the lower Montgomery Creek area of the Googong township. This species is listed as vulnerable in the NSW, ACT and at Commonwealth levels. During ecological surveys undertaken by Biosis Research for the EA, this species was found in the vicinity of one component of the Project, namely sewage pumping station 2 (SPS2). As a result, the sewage pumping station was moved upslope, away from this threatened species habitat and appropriate conservation measures proposed. The EA demonstrated that Stage 1 of the Project would not affect the species and committed to undertake further studies.

Since the finalisation of the EA, further studies for *Aprasia* have been undertaken as part of the EPBC Act referral for the township, and associated Googong township-foreshores working group process. These detailed surveys have resulted in the creation of an *Aprasia* Conservation Area being proposed within the lower Montgomery Creek area. This section discusses the recent study and the proposed conservation area.

4.4.2 Detailed additional *Aprasia* study

Biosis Research were engaged to prepare an assessment of the impacts of the Googong township upon known *Aprasia* habitat occurring within the proposed Googong township area (see Appendix C of this report). Targeted field surveys were undertaken in late 2010 during the appropriate survey season to confirm information obtained during a desktop review and any previous field studies. This information was then used to assess the quality of the habitat throughout the study area. The results of the survey and habitat value mapping were also used to inform the preparation of an 'Assessment of Significance' and to make recommendations for the design and ongoing management of a proposed *Aprasia* Conservation Area.

4.4.3 Peer review and expert input

Further reviews of the Biosis Research assessment were undertaken by Dr Will Osborne of the University of Canberra's Institute of Applied Ecology and the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC). Dr Osborne is a known local expert on *Aprasia parapulchella* and was engaged to review the Biosis Research assessment and

provide further advice regarding the protection of the species and the long-term management of the conservation area. The proposed *Aprasia* Conservation Area was revised as a result. The *Aprasia* Conservation Area was further revised following an additional review undertaken by DSEWPAC.

4.4.4 Proposed *Aprasia* conservation area

There is currently about 34ha of high to very high quality *Aprasia* habitat located in the lower Montgomery Creek area of the Googong township. CIC proposed to provide an *Aprasia* Conservation Area totalling about 52ha and containing up to 45ha of high quality habitat to support the long-term conservation of this species.

Thirteen (13) hectares of the proposed *Aprasia* Conservation Area is already being dedicated to QCC as part of the lower Montgomery Creek riparian corridor which is zoned the E2 – Environmental Conservation under the *Queanbeyan Local Environment Plan (Googong) 2009*. Therefore, a further 39ha of land (primarily zoned R5 – Large Lot Residential), would be added to create the 52ha *Aprasia* Conservation Area. Figure 6 of this report shows the extent of the *Aprasia* Conservation Area in relation to the masterplan for the township.

4.4.5 Long term ownership and management

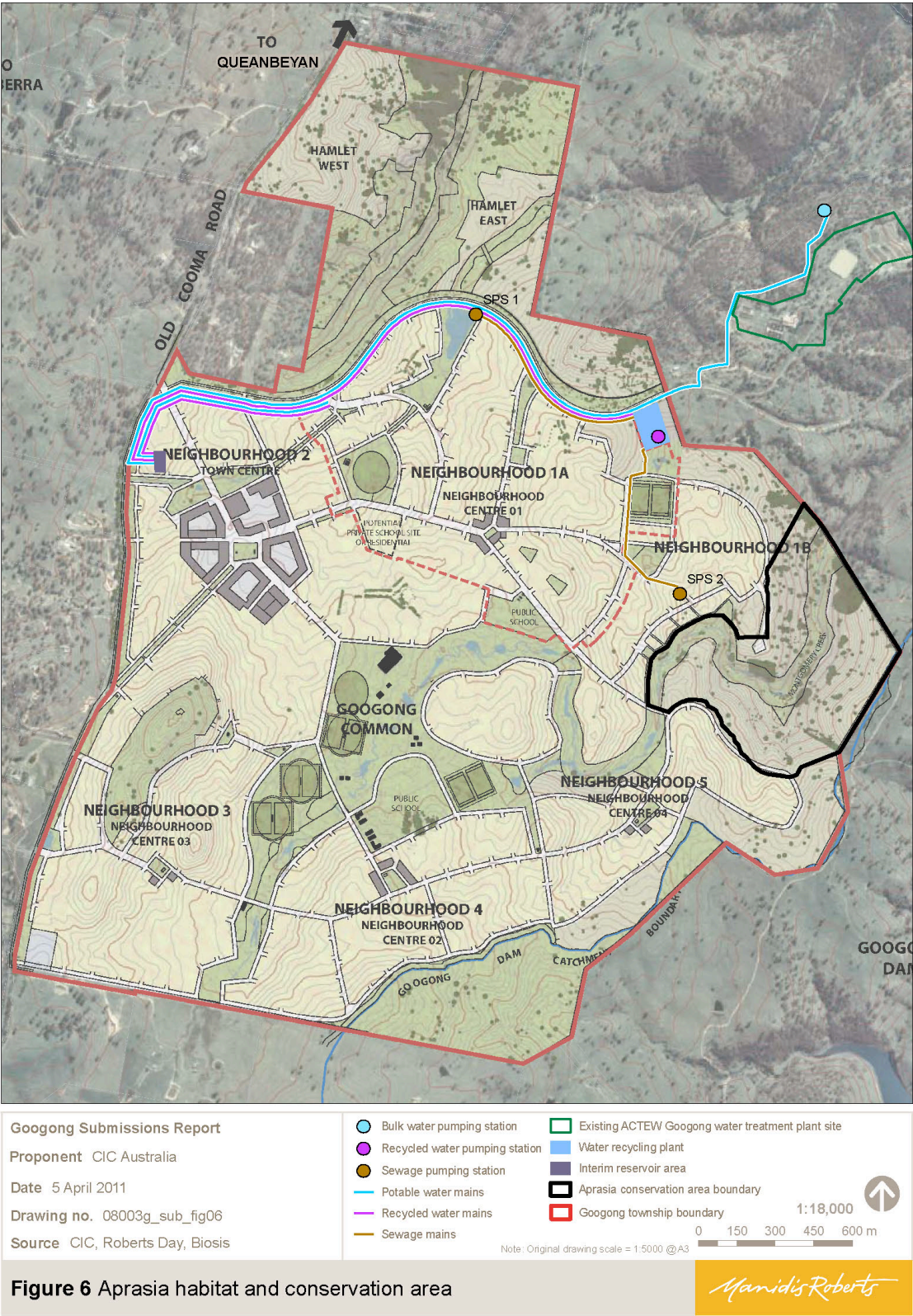
In the long term, the Conservation Area would be owned by QCC and a plan of management would be prepared for the land consistent with the requirements of the *NSW Local Government Act 1993*.

This plan of management would include the primary objectives of:

- Restoration and protection of the riparian zone of the Montgomery's Creek corridor.
- Restoration and protection of habitat for the *Aprasia* throughout the entire area.
- Maintenance of the area for bushfire asset protection purposes.

CIC will work with QCC to determine the bush regeneration and other measures that would be undertaken by CIC prior to dedication of the land.

Figure 6 Proposed Aprasia Conservation Area



As the final survey and detailed urban layout is not finalised for Neighbourhoods 1B and 5, it is required that there is some flexibility in the final boundary of the conservation area, while not decreasing the total size of the area.

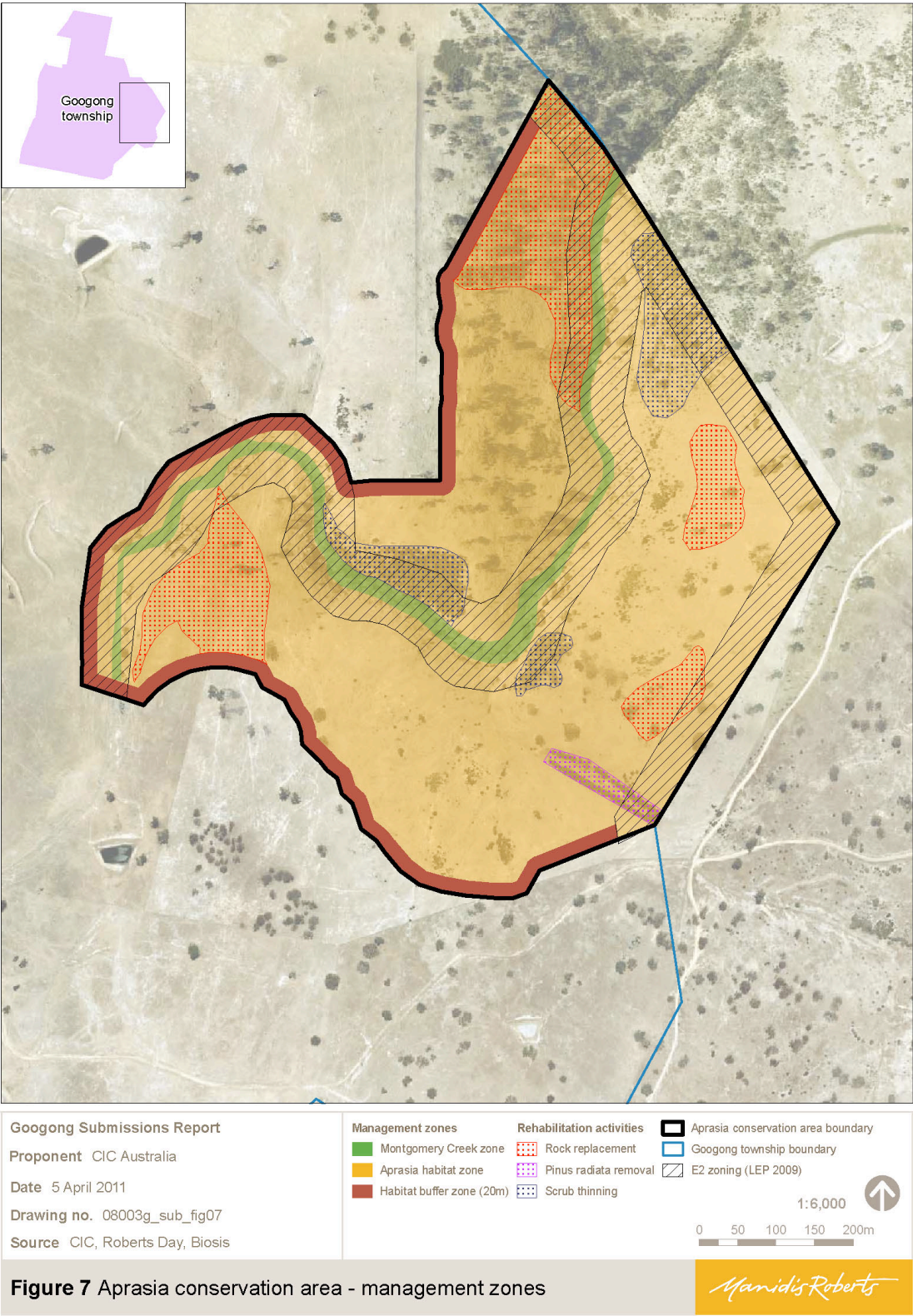
The *Aprasia* Conservation Area would be divided into three management zones (refer to Figure 7 of this report):

- *Aprasia* habitat zone – this is the majority of the *Aprasia* Conservation Area (45ha) and would be managed with the primary aim of maintaining and improving *Aprasia* habitat features.
- Habitat buffer zone – this is a 20m zone at the urban interface (4.2ha) and would be managed primarily to minimise edge effects.
- Montgomery Creek zone – this is the area immediately adjacent to, and including, the creekline (2.6ha), to be managed differently, as this does not represent suitable habitat for the species.

In accordance with the advice from Biosis Research and Dr Will Osborne, specific management and mitigation measures would include:

- Bush regeneration works and weed control:
 - The removal of the exotic woody vegetation such as Radiata Pine (*Pinus radiata*), Hawthorn (*Crataegus* sp.), African Boxthorn (*Lycium ferocissimum*), etc.
 - The targeted removal of the weed species Serrated Tussock (*Nassella trichotoma*) (approximately 50 plants) located within the Montgomery Creek riparian zone.
 - The translocation of suitable rocks (and translocation of any *Aprasia* individuals found) from areas of *Aprasia* habitat to be removed into the *Aprasia* Conservation Area.
 - Targeted revegetation and regeneration of selected areas with suitable native grasses (notably Kangaroo Grass (*Themeda triandra*) and Redleg Grass (*Bothriocloa macra*), where they are not currently the dominant species.
- Boundary treatment and minimisation of 'edge effects':
 - The design of the conservation area has resulted in a consolidated and connected area, which reduces the length of the boundary, resulting in a reduced potential for edge effects.
 - As advised by Dr Will Osborne and Biosis Research, a 20m wide habitat buffer zone has been provided along the urban interface (refer to Figure 7). This zone would be managed specifically to reduce the potential for edge effects.
 - Rural type fencing (without barbed wire) would delineate the boundary of the *Aprasia* Conservation Area along the urban interface.
 - Sealed roads/streets would be constructed around the boundary of the *Aprasia* Conservation Area, with residential lots located on the opposite side of the road/street. Biosis and Dr Will Osborne advise that the placement of roads in this manner is effective in discouraging the dumping of rubbish and spreading lawn clippings 'over the back fence' of private property.
- Community education program:
 - A community education program would be implemented at Googong at the point of sale of the residential properties and ongoing, which would include specifics regarding the conservation of the *Aprasia*. The details of the information and communication methods would be developed in consultation with experts in the field and relevant government agencies.

Figure 7 Aprasia Conservation Area Management Zones



4.4.6 Implications for the water cycle project

The main implication for the Project is that sewage pumping station 2 (SPS2) is likely to be able to be moved further downslope (if required for engineering purposes) without resulting in any impacts on this species. It is not proposed to move SPS2 at this stage, however this flexibility in the design will be considered at detailed design stage. If SPS2 is required to be moved downslope, a buffer zone of at least 20m wide would still be provided between SPS2 and the *Aprasia* Conservation Area. The environmental impacts of the relocation of SPS2 are not expected to be materially different to those predicted for the Project in the EA.

4.4.7 Conclusion

The Project assessed under Part 3A of the EP&A Act would not result in any impacts upon the Pink-tailed Worm Lizard.

In terms of the township as a whole, it has been determined that the proposed location and extent of the conservation area will result in a qualitative and quantitative long-term benefit to *Aprasia* habitat within the locality. Thus, the proposed approach will ensure that the proposed development of the Googong township is unlikely to have a significant impact on *Aprasia parapulchella*.

This approach would also allow the relocation of SPS2 further downstream, if considered necessary, to improve engineering outcomes for the water cycle infrastructure. This would be considered during the detailed design stage.

4.5 Conclusions

The submissions and ongoing consultation with stakeholders identified refinements that could be made to the Project. The following requested refinements to the Project are proposed:

- A change to the location of the bulk water pumping station and associated infrastructure, to meet the operational requirements of the ACTEW Googong Water Treatment Plant.
- Alterations to meet the discharge requirements of the OEH regarding the total nitrogen (TN) and residual chlorine concentration in excess recycled water to be discharged into the stormwater management system. Minor amendment to the WRP process is required to meet the TN requirement. Two feasible options have been identified to meet the residual chlorine requirement: de-chlorination at the discharge point; or a separate non-chlorinated recycled water pipeline for discharge. The final option would be selected during detailed design of the Project.
- The inclusion of an *Aprasia* Conservation Area as part of the township will result in an improved environmental outcome for this species. It would also allow small changes to the location of some of the Project's sewage infrastructure to be made for engineering reasons, if required.

It is noted that these refinements to the Project have not been proposed to minimise the environmental impact of the Project. As described, they are generally consistent with the Project described in the EA and within the context of the entire Project, these refinements are considered to be minor. They will not materially change the environmental impacts predicted for the Project in the EA.

5 Revised statement of commitments

This chapter provides the Statement of commitments, which has been revised based on the submissions received for the Project. Certain submissions suggested specific changes to a commitment, while other commitments have been altered to reflect aspects of a submission.

5.1 Summary of changes to the statement of commitments

As a result of the submissions received, the following three commitments have been revised, with two additional commitments being added.

- **Commitment H1 (page 91)** has been amended in accordance with Submission 8. Originally the commitment read that the avoidance, relocation or disturbance of any Aboriginal heritage sites and PADs will be in accordance with OEH guidelines and permits. In Submission 8, it was raised that as this development is being assessed under Part 3A of the EP&A Act, there will be no requirement for any OEH Aboriginal Heritage Impact Permits. This is only a minor change.
- **Commitment H2 (page 91)** has been amended in accordance with Submission 8. The request was made by OEH for clarification of how unknown Indigenous heritage items will be located and identified during construction and by whom. Further information has been added to the Commitment to clarify the questions raised by OEH. Specifically, the site environmental officer would identify the issue and all works in the vicinity of the find would cease until specialist heritage advice occurs.
- **Commitment NH3 (page 91)** has been amended to include the request (submission not included in this report) made by the Heritage Branch of the NSW Department of Planning (now part of OEH). This Commitment has been amended to note that the OEH would be notified and that works in the vicinity of the find would cease until specialist heritage advice has been obtained.
- A new **Commitment D3 (page 79)** has been added following Submission 9 from QCC. Submission 9 recommends that all construction and operational activities associated with Googong's water supply system and sewerage system follow the Council's *Development Specification – Googong*. Commitment D3 recognises the importance of this recommendation, and has committed to compliance with this specification for the Project.
- A new **Commitment G8 (page 89)** has been added following Submission 10 from NSW Office of Water (NOW), regarding the timing of groundwater assessment as part of an overall program of further monitoring and assessment in terms of the staging of construction works. The groundwater monitoring program is to be undertaken as outlined in Table 12 of this report.

5.2 Revised Statement of commitments

The table below provides the revised Statement of commitments for the Project.

Objective	Ref. no.	Commitment	Timing	References
Project detailed design				
Ensure final location and design of all water cycle infrastructure minimise impacts on natural environment and human health.	D1	Any location and/or design changes will be subject to a consistency assessment, informed through a desktop analysis of each of the environmental issues addressed in this EA.	Prior to construction	Chapter 5 and Part B of the EA.
	D2	Where any final location and/or design changes are not generally consistent with the Part 3A approval of the Project, the proponent will apply for modification under Section 75W of the EP&A Act.	Prior to construction	Chapters 3, 5 and Part B of the EA.
	D3	The construction and operation of the Project will comply with Queanbeyan City Council's <i>Development Specification – Googong</i> .	Construction and operation	Submission 9.
Construction management				
Put management systems in place for protection of the environment.	C1	A construction environmental management plan (CEMP) will be developed in consultation with relevant agencies to manage the environmental issues assessed in this EA and implement the identified mitigation and management measures where required.	Prior to construction	Chapters 6 and Part B of the EA.
Minimise impacts on human amenity as a result of construction hours.	C2	Construction work will generally be undertaken between the hours of 6.00am and 7.00pm Monday to Friday, and 8.00am to 1.00pm Saturdays. At all other times, construction noise levels will be as agreed with the relevant receiver(s).	Construction	Chapter 5, Section 13.4 and Appendix J of the EA.
Operational management				
Ensure comprehensive monitoring of operation of the water cycle.	OP1	<p>Establishment and location details for monitoring sites will be in accordance with WQ4. Results of all monitoring programs that form part of these Statement of Commitments will be considered in terms of overall environmental impact on a regular basis, including:</p> <ul style="list-style-type: none"> The trade-off between potable water savings, reduction in stormwater discharges and increased recycled water discharges. Relative impacts of excess recycled water discharges compared to impacts on soil and groundwater from recycled water uses. The timeframe for relative comparisons of impacts of components of the water cycle will be determined in consultation with the relevant government agencies. The ability to feedback results for further stages of Googong 	Operation	Chapters 5 and 7 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Ensure comprehensive monitoring of operation of the water cycle.	OP1	<p>Establishment and location details for monitoring sites will be in accordance with WQ4. Results of all monitoring programs that form part of these Statement of Commitments will be considered in terms of overall environmental impact on a regular basis, including:</p> <ul style="list-style-type: none"> The trade-off between potable water savings, reduction in stormwater discharges and increased recycled water discharges. Relative impacts of excess recycled water discharges compared to impacts on soil and groundwater from recycled water uses. The timeframe for relative comparisons of impacts of components of the water cycle will be determined in consultation with the relevant government agencies. The ability to feedback results for further stages of Googong township. 	Operation	Chapters 5 and 7 of the EA.
	OP2	Telemetry will be installed on all major water cycle infrastructure to gather operational data.	Operation	Chapter 5 of the EA.
	OP3	<p>Management plans will be reviewed with consideration of the outcomes of monitoring programs:</p> <ul style="list-style-type: none"> Additional management and mitigation measures will be implemented, should monitoring identify that the water cycle system is operating outside of modelled or expected parameters. 	Operation	Chapter 6 of the EA.
	Community and stakeholder consultation			
Ensure effective consultation with community and other stakeholders is continued.	CS1	A combined consultation strategy for community stakeholders and key government agencies will continue to be implemented throughout the Project. The outcomes of ongoing consultation will continue to influence the Project.	Prior to and during construction and operation	Chapter 16 of the EA.
Ensure all affected stakeholders are kept informed of the construction schedule.	CS2	During construction, affected communities will be informed prior to the start of any works in their area and will be notified at regular intervals throughout the construction process according to a project-specific community engagement and stakeholder management plan.	Construction	Chapter 16 of the EA.
Ensure coverage of water cycle issues in the broad community education strategy for the Googong township.	CS3	A community education strategy will be developed, which will focus on minimising environmental and human health risks associated with the use of recycled water.	Prior to and during construction and operation	Chapters 8 and 16 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Water quality and hydrology				
Implement water quality and hydrology management procedures.	WQ1	To reduce risks associated with water quality, soil and water management plans will be developed and implemented for the construction phase, via the CEMP, in accordance with <i>Managing urban stormwater: soils and construction, Volume 1</i> (the Blue book).	Prior to and during construction	Chapter 7 of the EA.
Minimise the risk of surface water contamination.	WQ2	<p>A spill management and response procedures will be developed in the CEMP for the construction phase of the Project. These will specify that:</p> <ul style="list-style-type: none"> Any fuels and chemicals will be stored to meet relevant standards in banded or contained areas and a spill kit will be provided at all locations where fuels and/or chemicals are used. Fuel and chemical storage sites will not be located in the vicinity of any permanent and/or flowing waterway. The maintenance or refuelling of equipment will not be undertaken within the vicinity (within 150m) of any waterway. 	Construction	Chapter 7 of the EA.
Ensure bank stabilisation in construction sites.	WQ3	<p>The CEMP will incorporate measures to ensure that creek banks are stabilised during the construction phase, such as:</p> <ul style="list-style-type: none"> Stabilising where required by establishing rocks, sandbags/ matting to prevent scouring, ensuring that they are placed to conform as far as possible with existing contours. Respreading topsoil over the area from where it was removed. 	Construction	Chapter 7 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Monitor impacts on waterways.	WQ4	<p>A monitoring program to assess the potential impacts of the Project on the Queanbeyan River (including water quality, flow, fish migration, macrophytes and macro invertebrate communities) will be undertaken.</p> <ul style="list-style-type: none"> Details of the monitoring program will be determined in consultation with relevant government authorities/stakeholders (including the OEH, DPI and, potentially, ACTEW Corporation). Such consultation will ensure the sharing of available data for the Queanbeyan River for comparative and impact assessment purposes. A new monitoring site within the Queanbeyan River is proposed to measure water quality and aquatic ecology impacts over the medium term. This site will be located near the confluence of Googong Creek and Queanbeyan River (and will be sited to enable comparison with data collected from upstream and downstream sites). Monitoring will commence approximately 12 months prior to commissioning the water recycling plant. 	Prior to and during construction, and during operation	Chapter 7 and Section 11.2 of the EA.
	WQ5	The operation environmental management plan (OEMP) will outline erosion and sediment control measures to protect buffer and riparian vegetation zones, in general accordance with Statement of Commitment WQ3.	Operation	Chapter 7 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Human health				
Ensure recycled water meets all relevant guidelines.	HH1	<p>Recycled water will meet the requirements for non-potable domestic use as defined in the <i>Australian Guidelines for Water Recycling: Managing Health and Environmental Risks</i> (NRMHC, EPHC & AHMC, 2006).</p> <p>Recycled water will be appropriately planned and industry accepted management systems put in place to assure appropriate product quality.</p>	Operation	Chapter 8 of the EA.
	HH2	<p>A Recycled Water Risk Management Plan (RWRMP) will be prepared based on the risk management framework outlined in <i>Australian National Guidelines for Water Recycling – Managing Health and Environmental Risks</i> (2006). This RWRMP will be a living document that will be refined throughout operation of the recycled water scheme. It will involve:</p> <ul style="list-style-type: none"> • Developing the RWRMP through hazard identification (for the operation of the recycled water system and use of recycled water). • Identifying the significant human and environmental health risks. • Conducting validation, operational and verification monitoring to determine the success of the following respective components of the scheme: the risk management system, preventative measures, and the achievement of safe and sustainable water recycling. • Completing the RWRMP, based on the monitoring results. 	Prior to operation and during operation	Chapter 8 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Reduce risks associated with exposure to recycled water.	HH3	<p>The Proponent will apply the following risk management practices to limit exposures to recycled water:</p> <ul style="list-style-type: none"> • Installation regulations and codes of practice that include systematic processes to reduce the probability of cross-connections. • Materials codes and regulations that easily discriminate drinking and recycled water plumbing. • Regulations that limit the legal installation and modification of plumbing systems to licensed individuals. • Education on recycled water use and the need to avoid creating cross-connections. • Installation of backflow prevention. • Operational checking (that is, testing of recycled effluent quality following treatment) and connection auditing. • Continue to liaise with relevant stakeholders to ensure awareness and understanding of the Project (including discharges of excess recycled water to the environment) and to address arising issues. 	Construction and operation	Chapter 8 of the EA.
Soil				
Ensure proper management of soils.	S1	<p>Soil and water management plans will be developed and implemented for the construction phase, via the CEMP, in accordance with <i>Managing urban stormwater: soils and construction, Volume 1</i> (the 'Blue book').</p> <p>Soil types will be identified and delineated within the study area. Soil management measures will be developed according to soil type and be documented in the CEMP.</p>	Prior to construction	Chapter 9 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Prevent soil erosion and minimise loss of topsoil.	S2	<p>The CEMP will detail erosion and sedimentation control measures, to maintain surface and soil stability at all times during cut and fill excavation activities (also necessary to ensure site safety).</p> <p>Graded soil will be stockpiled separately so that local soils can be recovered for respreading. During restoration and cleanup, the following will be applied in relation to stabilisation of soils:</p> <ul style="list-style-type: none"> • Reprofilling of the site to achieve soil stability and congruity with the surrounding landscape. This will be done in consideration of the landscape and open space strategy (LOSS) for the Googong township. • Reseeding and the use of geotextile materials as required. • Backfilling of trenches in layers with compaction. • Management and exclusion of site access to assist with site recovery. 	Construction	Chapter 9 of the EA
Prevent and manage spills.	S3	<p>To prevent and manage spills, the proponent will:</p> <ul style="list-style-type: none"> • Implement chemical transport, storage, handling and disposal procedures, in accordance with requirements for dangerous goods, of environmental legislation and industry standards. • Ensure spill response procedures and equipment for containment and recovery are available on site. • Conduct workforce training on the transport, storage, handling and disposal procedures relating to chemicals. 	Construction and operation	Chapter 9 of the EA

Objective	Ref. no.	Commitment	Timing	References
Manage potential and/or real soil contamination on site.	S4	<p>To manage soil contamination, the proponent will:</p> <ul style="list-style-type: none"> • Manage contaminated soil disposal or removal from site in accordance with <i>OEH Waste Classification Guidelines</i>. • Conduct further investigations at the newly identified area of concern (AEC – identified as Site 3 in Section 9.3.5 of the EA) prior to construction. An OEH accredited site auditor will provide advice on the need for further investigations at AEC3, if it is to be disturbed by the Project. • Develop a sampling strategy for AEC2 (shown in Section 9.3.5 of the EA) as soon as the existing uses at the site cease, in consultation with a OEH accredited site auditor. If potential or actual contamination is found during earthworks, stop all work in the affected area until a suitably qualified person has inspected the site, the hazard has been assessed and appropriate action has been taken (including delineating areas of concern as required until earthworks can resume safely). 	Prior to and during construction	Section 9.3.5 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Ensure minimal impact on soil salinity and groundwater quality	S5	<p>Ensure that appropriate materials are used to mitigate against the corrosive impacts of high salinity.</p> <p>Design, where possible, the salt sensitive urban stormwater drainage system to direct potential saline runoff to a water body that is able to assimilate the expected salt load being applied to the landscape, without adverse impacts on aquatic and riparian ecosystems. Place and design built structures in consideration of existing and potential soil salinity levels.</p> <p>The proposed WRP should be designed to minimise the need for additions of chemicals for phosphorus removal, to minimise salt loading. The Proponent will explore options to switch off the phosphorus removal process during peak irrigation demand periods in accordance with Statement of Commitment OP1.</p> <p>Early stages of Googong township will be used as a trial to better understand the movement of salt in the landscape. It will involve the installation of carefully located piezometers and the monitoring of results, as well as monitoring the effectiveness of pre-emptive measures such as any subsurface drainage system. The results will be used to improve strategies for ensuing stages.</p> <p>Recycled water users will be informed of the specific risks associated with irrigation with recycled water, in the context of developing a complete awareness of the Project and its environmental trade-offs. This will include:</p> <ul style="list-style-type: none"> • Education on salinity impacts on soil and plant damage and regrowth. • Encouragement to grow salt-tolerant species, particularly in areas considered to be of high risk. <p>Householders will be educated on the benefits of using detergents that are low in phosphorus, sodium and salt – in terms of the impact on recycled water quality. This will form part of the broad community education program.</p>	Prior to and during construction and during operation	Chapter 9 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Groundwater				
Prevent impacts to groundwater recharge.	G1	Timing of trench construction will be monitored and planned to ensure, where practical, the time the trench is open is reduced and during periods of low rainfall.	Construction	Chapter 10 of the EA and Appendix E of the EA.
Minimise groundwater contamination.	G2	<p>Site environmental management measures will be developed and outlined in the CEMP with the purpose of minimising the potential for spills to occur and implementing remedial actions (refer to SG1). These will include:</p> <ul style="list-style-type: none"> • Mapping unregistered nearby groundwater bores, if identified. • Ensuring that all refuelling, where possible, occurs at designated fuel distribution points. These points will be underlain by compacted earth to prevent the significant loss of fuel to the ground during a spill and will be banded to contain large spills. 	Prior to and during construction	Chapter 10 of the EA and Appendix E of the EA.
Monitor groundwater quality to minimise adverse impacts.	G3	<p>Develop a groundwater monitoring program for the Project in consultation with relevant stakeholders. This program will address the following:</p> <ul style="list-style-type: none"> • The salt levels in groundwater will be regularly monitored during and after Stage 1 of the Project. • Groundwater samples will be collected from both the shallow and regional aquifers, and soil conductivity (that is, salt) mapping will be carried out where possible in areas of inferred impact. • The monitoring of salt levels in the receiving waters will be indicative of the effectiveness of the stormwater system (refer below). 	Operation	Chapter 10 of the EA and Appendix E of the EA. Table 12 of this report.
Minimise impact on drainage.	G4	Develop the layout of infrastructure to reduce the impact on natural surface and subsoil drainage.	Prior to construction	Chapter 10 of the EA and Appendix E of the EA.
Minimise the potential for groundwater mounding.	G5	Construct in accordance with the approved materials and provisions of water supply code (WSA) 03-2002 to minimise leakage from water cycle infrastructure.	Construction	Chapter 10 of the EA and Appendix E of the EA.
Minimise the potential for waterlogging.	G6	The risks associated with waterlogging will be considered and accommodated through the design of the drainage system. Irrigation systems will be designed and scheduled to avoid overwatering.	Prior to construction (for operation)	Chapter 10 of the EA and Appendix E of the EA.

Objective	Ref. no.	Commitment	Timing	References
Minimise salinity impacts on soil and plant growth.	G7	Soil monitoring in low-lying areas, where salt is likely to accumulate, will be undertaken. If salt levels were shown to be increasing, engineered drainage structures to nearby creek lines will be constructed. As a preventative measure, to avoid future bare soil patches and erosion, salt-tolerant landscaping will be used in low-lying areas.	Operation	Chapter 10 of the EA and Appendix E of the EA.
Further investigate the groundwater environment, potential changes to recharge, and likelihood of long-term impacts.	G8	Undertake the groundwater monitoring program as outlined in Table 12 of this report.	Prior to and during construction and operation	Chapter 10 of the EA. Appendix E of the EA. Table 12 of this report.
Terrestrial flora and fauna				
Protect native flora and fauna.	F1	A flora and fauna management plan will be prepared prior to construction as part of the CEMP. All feasible and reasonable measures will be undertaken to minimise the impact of construction on native vegetation and fauna including: <ul style="list-style-type: none"> • Minimising the disturbance of native flora and hollow-bearing trees. • Implementing weed control measures. • Revegetating with endemic species. • Minimising soil disturbance. • Implementing clearing protocols to protect flora and fauna. 	Prior to and during construction	Chapter 11 of the EA and Appendix F of the EA.

Objective	Ref. no.	Commitment	Timing	References
Protect threatened flora and fauna.	F2	<p>The Flora and fauna management plan (within the CEMP) will contain specific additional measures for threatened species, including:</p> <ul style="list-style-type: none"> Only approved works will be undertaken within 5m of a threatened species and exclusion fencing will be erected around threatened flora species and threatened fauna habitats and maintained in place until such time as construction works are completed, unless otherwise approved by OEH. Site-specific management measures will be implemented for the protection of the Pink-Tailed Worm Lizard near the site proposed for SPS2 and at Hill 800, and for the Hoary Sunray near the BWPS site, including exclusion zones, signage and pre-construction surveys. These works will be undertaken under the supervision of an appropriately qualified ecologist. 	Prior to and during construction	Section 11.1 of the EA and Appendices F and P of the EA.
Protect terrestrial flora and fauna.	F3	An Operational environmental management plan (OEMP) will be prepared for the Project, and implemented. This will detail emergency, spill and maintenance procedures as well as monitoring and reporting regimes as they relate to the protection of terrestrial and aquatic ecology.	Operation	Chapter 11 of the EA and Appendix F of the EA.
Aquatic ecology				
Avoid impacts on and monitor changes to aquatic ecology.	A1	<p>Aquatic ecology impacts are considered under WQ4.</p> <p>A water quality and aquatic ecology monitoring program will be developed to monitor construction and operation impacts of the Project on waterways (refer to WQ4 for further details). The monitoring program will include siting of the aquatic ecology monitoring location to ensure viable comparison with historical and other recent river ecology data.</p> <p>Riparian vegetation, weeds and invasive scrub will be managed within the Googong township site. This will include surveying, mapping and managing invasive species.</p>	Prior to and during construction, and during operation	Chapter 7 and Section 11.2 of the EA.
Minimise impacts on aquatic habitats.	A2	Riparian zones within the Googong township site will be revegetated with species of local provenance to increase stability. Further measures to ensure minimal impact on aquatic habitats are addressed in Statement of Commitments WQ1-WQ5.	Construction	Chapter 7 and Section 11.2 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Indigenous (Aboriginal) and non-indigenous cultural heritage				
Indigenous heritage				
Avoid and/or minimise impacts on indigenous heritage.	H1	Generally, indigenous heritage on the site will be managed in accordance with Appendix G of the EA, including the four identified indigenous heritage sites. The avoidance, relocation or disturbance of any Aboriginal heritage sites and PADs will be in accordance with relevant guidelines and permits. An archaeologist and representatives of the local Aboriginal community will conduct any relocation works.	Prior to and during construction	Chapter 12 of the EA and Appendix G of the EA.
Protect unknown indigenous heritage	H2	Should any unknown indigenous heritage items be located during the proposed works by the site environmental officer or any other construction staff, all work will cease in the vicinity of the find until specialist indigenous heritage advice is received.	Construction	Chapter 12 of the EA and Appendix G of the EA.
Non-indigenous heritage				
Avoid and/or minimise impacts on non-indigenous heritage.	NH1	Generally, non-indigenous heritage on the site will be managed in accordance with Appendix G of the EA. Construction and maintenance activities will be managed to avoid structural damage on heritage items as a result of vibration. Construction activities will be excluded from the identified heritage sites. However, if impacts are unavoidable then a further heritage assessment of the impacted site(s) will be conducted.	Prior to and during construction	Chapter 12 of the EA and Appendix G of the EA.
Continue to investigate heritage values of site GH14 (refer to Section 7.3 of Appendix G of the EA).	NH2	Investigation into the value of site GH14 is continuing. The results of this study will inform the approach to mitigation of impacts to non-indigenous heritage.	Prior to construction	Chapter 12 of the EA and Appendix G of the EA.
Protect unknown non-indigenous heritage items.	NH3	If any material of potential archaeological significance is unearthed, work will cease in the vicinity of the find until specialist heritage advice has been obtained. The NSW Heritage Council will be notified of the discovery of any relics.	Construction	Chapter 12 of the EA and Appendix G of the EA.

Objective	Ref. no.	Commitment	Timing	References
Traffic, transportation and access				
Minimise disturbance to local traffic and amenity during construction.	T1	<p>A traffic management plan will be prepared prior to the commencement of construction. It will detail traffic arrangements for the construction phase of the Project. This will include:</p> <ul style="list-style-type: none"> • The use of standard mitigation and management controls. • Planning of vehicle use to maximise efficiency and reduce vehicle trips. • An education program for construction personnel in relation to local traffic arrangements (as per the plan) and local conditions (such as the intersection of Googong Dam Road and Old Cooma Road). • Access to properties and provisions for temporary access. <p>A traffic control contractor will be engaged to implement the traffic management plan (such as partial road closures), where necessary specialist advice is required.</p>	Prior to and during construction	Section 13.1 of the EA and Appendix H of the EA.
Manage traffic, transportation and access with local authorities.	T2	<p>Traffic, transportation and access will be managed in consultation with relevant stakeholders, including Queanbeyan City Council and the RTA, including impact mitigation and management measures to address partial road closures, access to properties and provisions for temporary access and re-instatement.</p>	Prior to and during construction	Section 13.1 of the EA and Appendix H of the EA.
Minimise the impact of transportation.	T3	Any oversized or overweight loads will be transported in accordance with RTA guidelines and requirements.	Construction	Section 13.1 of the EA and Appendix H of the EA.
Minimise impact of traffic and access on stakeholders and the local community.	T4	Councils, property owners and local community members will be informed of any potential loss of or disruption to access to properties, roads and/or pathways. Appropriate temporary measures to either provide alternative access or to reinstate access at the end of each workday will be negotiated with relevant parties.	Construction	Section 13.1 of the EA and Appendix H of the EA.
Manage operational traffic, transportation and access to minimise impacts on local conditions.	T5	<p>A Traffic management plan will be prepared for the operation and maintenance of key water cycle infrastructure, which will include:</p> <ul style="list-style-type: none"> • Standard management and mitigation measures for managing vehicle movements at water cycle infrastructure sites. • Timing of truck movements for deliveries and disposal, and parking arrangements. 	Operation	Section 13.1 of the EA and Appendix H of the EA.

Objective	Ref. no.	Commitment	Timing	References
Waste generation and management				
Practice responsible resource management during construction.	W1	<p>The CEMP will address the principles of the resource management hierarchy (avoidance, resource recovery and disposal in that order) and disposal will be to a licensed waste facility. The CEMP will include the following:</p> <ul style="list-style-type: none"> • Procedures to classify waste types in accordance with the Waste Classification Guidelines and NSW legislative requirements. • Resource recovery and re-use strategies for each waste type. • Details of treatment and storage of on-site waste. • Procedures and disposal arrangements for relevant materials. • Reporting and recording requirements for all waste movements, allowing determination of recycling and re-use levels achieved. 	Construction	Section 13.2 of the EA.
Practice responsible resource management during operation.	W2	<p>Operational management of wastes will be incorporated into the OEMP for the key sites. Some inclusions are procedures for:</p> <ul style="list-style-type: none"> • The collection and transportation of grit and screenings from the WRP to an appropriately licensed facility. • Treatment and handling of biosolids, suitable for use in agriculture, forestry, soil and site rehabilitation (Grade B), in accordance with OEH's <i>Environmental Guidelines on the Use and Disposal of Biosolids Products</i> (2007). • Management and monitoring of the discharge of treated effluent (recycled water) during commissioning and verification phases of the WRP operation. • Waste management for putrescible and recyclable wastes generated from the WRP and other water cycle infrastructure. • Procedures for the collection and dewatering of any solid matter removed through maintenance activities of water cycle infrastructure, and transportation and disposal off site. • Vehicle routes, and the timing of trips, associated with waste management, in consideration of the traffic management plan. 	Operation	Section 13.2 of the EA and Appendix B of the EA.

Objective	Ref. no.	Commitment	Timing	References
Air quality				
Ensure detailed design and urban layout of the Googong township meet air quality requirements for odour.	AQ1	<p>The dispersion modelling undertaken as part of the Googong New Town WRP Odour Impact Assessment will be validated at a later stage in the design, for the ultimate development. This will include consideration of:</p> <ul style="list-style-type: none"> • Site-specific meteorological data, collected at the WRP site for at least 12 months prior to commissioning. • Site specific odour data collected during and following commissioning, prior to the residential development of the immediate area west of the WRP. 	Prior to and during construction, and during operation of Stage 1 of the Project.	Section 13.3 of the EA and Appendix I of the EA.
Minimise odour impacts of WRP and SPS at nearby receivers.	AQ2	Odour control facilities at the SPSs and the WRP will be installed as detailed in the EA (refer to Sections 4.4.2 and 5.13 of Appendix B).	Construction	Section 13.3 of the EA and Appendices B and I of the EA.
Monitor, verify then act on odour complaints.	AQ3	Odour complaints will be registered and investigated. Verified odour issues will be addressed with engineering, operational or other mitigation and management measures.	Operation	Section 13.3 of the EA.
Minimise the impact of construction activities on dust generation.	AQ4	<p>The CEMP will include typical dust suppression measures. Nuisance dust will be minimised by:</p> <ul style="list-style-type: none"> • Reducing speed limits during high dust conditions. • Clearing vegetation and topsoil only within the designated footprint. • Progressive reinstatement of disturbed areas. • Employment of water trucks to reduce dust in dry, windy conditions. 	Construction	Section 13.3 of the EA.
Minimise dust generated by construction activities such as blasting.	AQ5	Blasting will be conducted at appropriate times, with consideration of site conditions and sensitive receivers.	Construction	Section 13.3 of the EA.
Manage construction activities according to weather conditions to minimise the potential for dust storms.	AQ6	Working practices will be modified during periods of high winds by limiting the use of some machinery, particularly when in close proximity to dwellings, and reducing vehicle travel speeds.	Construction	Section 13.3 of the EA.
Avoid adverse impacts on air quality due to smoke.	AQ7	The burning of material on site will be prohibited, except under the instruction of fire services.	Construction	Section 13.3 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Minimise emissions from vehicle use.	AQ8	Vehicles will be well maintained to ensure emissions are kept to the minimum practicable.	Construction	Section 13.3 of the EA.
Noise and vibration				
Minimise the noise impact associated with construction.	N1	<p>Construction noise and vibration management strategies will be outlined in the CEMP. Measures will include the overall construction times (refer to C2) as well as the following:</p> <ul style="list-style-type: none"> • Construction noise goals. • Liaising with community to advise on likely timing and duration of noisy activities. • Procedures for resolving complaints received from residents and landowners and dealing with exceedances (including the appointment of a liaison person to maintain relationships between the community and the construction contractors in accordance with AS 2436:1981 <i>Guide to noise control on construction, maintenance and demolition sites</i>). • Using noise abatement measures (physical and managerial) where reasonable and feasible. • Procedures for liaising with the relevant agencies to discuss the need to construct outside of regular hours, for specific cases. 	Construction	Section 13.4 of the EA and Appendix J of the EA.
Assess the potential for vibration impacts should blasting be required.	N1A	Should blasting at the WRP or SPS sites be necessary based on geotechnical information and construction methodology, a construction vibration assessment will be undertaken in accordance with <i>Assessing Vibration: A Technical Guideline</i> (DECC, 2006) to determine any additional management measures required for blasting activities.	Construction	Section 13.4 of the EA and Appendix J of the EA.
Meet noise requirements near the WRP site boundary during operations.	N2	The acoustic treatments specified for the WRP components, as outlined in Appendix J, will be implemented and then reviewed for effectiveness following noise measurement verification.	Construction and operation	Section 13.4 of the EA and Appendix J of the EA.

Objective	Ref. no.	Commitment	Timing	References
Hazards and risks				
Manage the operational risks associated with storage and delivery of chemicals.	R1	<p>Measures typical of facilities of the nature and size of the Project will include:</p> <ul style="list-style-type: none"> • Storing relevant chemicals below threshold quantity levels. • Undertaking activities in accordance with relevant MSDS's. • Installing bunded areas for the storage and delivery of chemicals in accordance with AS 3780:2008 <i>The storage and handling of corrosive substances</i> and the relevant MSDS's. • Developing and implementing appropriate procedures for delivery, handling and accidental spills of chemicals. 	Operation	Section 13.5 of the EA and Appendix K of the EA.
Manage risks in emergency and/or maintenance situations at the key infrastructure.	R2	<p>The OEMP and RWRMP will outline the management of emergency situations for all key water cycle infrastructure. For emergency or maintenance events associated with the WRP, the following will be implemented/installed, and will include measures such as:</p> <ul style="list-style-type: none"> • Telemetry at all key infrastructure (eg SCADA). • An alarm system. • Backup procedures should the power to infrastructure be interrupted. • First flush tank at the WRP and wet well emergency storage at the SPS's. • Overflows at the WRP and the SPS's. 	Operation	Section 13.5 of the EA.

Objective	Ref. no.	Commitment	Timing	References
Visual amenity				
Minimise visual impact by maintaining existing vegetation where practical.	V1	<p>At relevant sites, existing vegetation will be maintained where practical and where appropriate.</p> <p>Additional vegetation will be planted along site boundaries to obscure views of infrastructure from sensitive receivers.</p>	Construction and operation	Section 13.6 of the EA and Appendix L of the EA.
Minimise the visual impact of the reservoirs and access road (located on Hill 800).	V2	<p>Visual impact of the reservoirs will be minimised through painting the structures a colour that will be chosen as the most compatible and/or appropriate with the surrounding environment and proposed Googong township.</p> <p>The landscaping approach for the reservoirs and associated access road will ensure minimal visual impact by:</p> <ul style="list-style-type: none"> • Achieving the most appropriate finished landform profile of the top of the hill that integrates the reservoirs. • Detailing siting and design of any elements over and above the reservoirs to minimise visibility (eg plant equipment, fencing, signage and lighting). • Ensure the access road alignment is a careful balance of limited visible road profile and minimised cutting/embankment visibility where following contours. • Considering the location and extent of tree groups to best mitigate visual impacts. • Considering soil and microclimate factors and amelioration to ensure healthy and rapid tree growth. 	Construction and operation	Section 13.6 of the EA and Appendix L of the EA.

5.3 Confirmation of timing of additional groundwater studies

Table 12 below clarifies the proposed timing of the additional groundwater studies identified in Statement of Commitment G3 above and in response to Submission 10 (NSW Office of Water). This table replaces Table 10.1 of the EA, which contained some statements about timing that needed to be clarified.

Table 12 Recommended scope of works and timing for future groundwater monitoring program

Item	Task	Recommended scope of works	Timing
1	Obtain further site-specific baseline data on aquifer characteristics, groundwater levels and groundwater qualities, to monitor trends in groundwater levels and quality, and model the impact of long-term development of the site on groundwater resources.	Carry out groundwater drilling and hydraulic testing across entire study area, aimed at identifying the depth and morphology of the water table, as well as the hydraulic properties and groundwater chemistry of: <ul style="list-style-type: none"> The Colinton Volcanics. The Googong Adamellite. Any soil horizons and/or discontinuities of interest. 	To commence as soon as practical after approval of the Project.
2	Obtain quantitative predictive modelling for parameters across the study area to quantify the impacts of the Project.	Once baseline data have been obtained, a computer model of the area should be compiled using the modular finite-difference flow model package MODFLOW, and the impacts of the development on groundwater levels and water table morphology should be assessed. At this stage, it is recommended that MODFLOW be used to simulate a range of potential climatic conditions (including reduced rainfall at the site as a result of global warming), and a conservative estimate of the changes in the groundwater table depth and morphology be assessed. From this, the impacts on local groundwater users and groundwater-dependent ecosystems can be further assessed, with this information passed on to the ecological consultants involved in assisting with issue 3 below.	After the completion of Item 1.
3	Clarify the position of the groundwater divide, and the effect of recharge changes due to the Googong township on the position of the divide. This is necessary to ensure that recycled water is not applied to groundwater sources for the Googong Dam Reservoir.	Carry out a groundwater drilling and hydraulic testing program aimed at identifying the depth and morphology of the water table in the south-eastern corner of the site, as well as the hydraulic properties of the Colinton Volcanics, and possibly Silurian intrusions, in this area. Once these data have been obtained, the MODFLOW groundwater flow can be used to predict the effect of recharge changes on the position of the divide.	Concurrently with items 1 and 2.
4	Clarify the long-term effects of the Googong township development and climate change. This is necessary so that changes to planning and management of later stages can be introduced if required.	Establish groundwater level and salinity monitoring program, including installation of water-level loggers in monitoring wells, and periodic measurement of salinity in groundwater and in surface watercourses. Also establish a soil salinity monitoring program, using EM31.	Commence once monitoring wells installed. Review results annually.

6 Conclusion

This report responds to the submissions made on the Part 3A EA during and following the public exhibition phase for the Project, which occurred in November and December 2010.

A relatively small number of submissions (12) were received through the DPI. The number and content of submissions showed that there is general support for the Project from government agencies, while small numbers of local community members raised concerns about specific aspects of the operation of the Project, specifically the quality of the Queanbeyan River as a result of the proposed discharge of excess recycled water via the Googong township's stormwater system.

This report concludes that the Googong township water cycle project (the Project) is justified and should be approved, as it has many direct and indirect benefits, while having minimal potential impacts.

6.1 The Googong township

As discussed in Sections 1.2 and 1.3 of this report, the Googong township is necessary in order to meet the growing population demands of Queanbeyan, Canberra and the greater Sydney-Canberra corridor region. The Googong township will deliver 55 percent of the 10,000 dwellings planned for Queanbeyan, and 22 percent of the dwellings planned for the Sydney-Canberra Corridor, under the areas' respective 25 year strategies. The Project will meet the water and wastewater infrastructure needs of the Googong township in a sustainable manner, enabling the 16,000 residents of Googong to use the same amount of water that traditionally sustains only 6,000 people.

6.2 Submissions on the environmental assessment

Chapter 2 of this report discussed the nature and content of submissions received regarding the environmental assessment prepared for the Project. The submissions reflected the lengthy, comprehensive and ongoing design and consultation process that has occurred for the Project, which has resulted in an optimum outcome in terms of technical design and government agency expectations.

The key issues contained in the submissions were:

- That more information should be provided regarding aquatic ecology and stormwater.
- That minor amendments or refinements should be made to the proposal to address infrastructure operational requirements or to respond to different discharge requirements.
- That further clarity regarding certain environmental or design aspects should be provided.
- That the riparian rights of certain Wickerslack Lane residents, who extract water from the river for domestic and stock purposes, may be affected by the discharge of excess recycled water into the stormwater management system.

This report shows that the issues raised by government agencies and the community within their submissions have been fully considered and addressed. As discussed in Section 2.2, several submissions included comments that are related to the Googong township as a whole, or are otherwise

not relevant to the Part 3A water cycle infrastructure (the Project). This report has addressed the issues raised in the submissions that are related to the Project, as more general issues associated with other aspects of the township are assessed elsewhere, such as within the approved rezoning of Googong or the Part 4 of the EP&A Act subdivision development application.

6.3 Response to the issues raised

Sections 2.3, 2.4 and 2.5 of this report detailed the response to the issues raised in each submission. These sections identified where in the environmental assessment or other documentation the particular issue is addressed, or where in this submissions report further clarifications or information is provided. These sections provided specific responses to the comments within each submission.

Chapter 3 responded further to specific comments contained within several submissions. This chapter provided further clarification of issues associated with potential impacts to downstream environments and communities, in terms of water quality, aquatic ecology and the proposed stormwater management strategy for the Googong township.

As discussed throughout this report, the overarching design philosophy is based on the NSW Government requirement that the ambient water quality in the Queanbeyan River is maintained post-development. Therefore:

- The Project is unlikely to result in significant impacts upon the downstream environment.
- The Project will not affect the riparian water rights of downstream users.

Further, the extensive water quality monitoring program that would be implemented would ensure that any potential issues that arise are identified early and managed accordingly.

6.4 Refinements to the Project

As a result of certain submissions and ongoing stakeholder consultation, some refinements to the Project have been proposed, which are detailed in Chapter 4 of this report – the preferred project report. These were:

- A change to the location of the bulk water pumping station, to meet the operational requirements of the ACTEW Googong Water Treatment Plant.
- Identification of minor operational changes and two feasible options to meet the discharge requirements of the OEH. The final option would be selected during detailed design.
- The inclusion of an *Aprasia* Conservation Area as part of the township, which may enable small changes to the location of sewage infrastructure in the future to improve engineering outcomes.

These refinements are considered minor, generally consistent with the Project described in the EA that was placed on exhibition, and would not result in materially different environmental impacts.

6.5 Conclusion

This submissions report concludes that the Project would provide the necessary water and wastewater infrastructure for the Googong township in a manner that is sustainable, and suitable for the characteristics of the site and the local area. Potential environmental impacts of the Project have been, and would continue to be, avoided, managed and mitigated during construction and operation.

Therefore, it is recommended that:

- The concept plan for the Project and the project application for Stage 1 of the Project be approved.
- The revised statement of commitments provided in Chapter 5 of this report be adopted as conditions of approval for the Project.

Appendix A

Googong bulk water pumping station – flora and fauna assessment report



Googong Bulk Water Pumping Station Flora & Fauna Assessment Report

A report prepared for CIC Australia

May 2011

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DOCUMENT CONTROL SHEET

PROJECT	Googong Bulk Water Pumping Station Flora & Fauna Assessment Report
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BIOSIS PROJECT NO	12826
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REPORT FOR	CIC Australia
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REPORT TITLE:	Googong Bulk Water Pumping Station Flora & Fauna Assessment Report
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AUTHOR(S):	Josephine Dessmann & Robert Speirs
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REVISION	PREPARED	INTERNAL REVIEW	EXTERNAL REVIEW	AMENDED
Draft	Josephine Dessmann Robert Speirs	Jennifer Charlton Brett Morrissey	M. Rivera	21/02/2011
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Final	Josephine Dessmann	Robert Speirs	DoP	04/04/2011
Final	Josephine Dessmann	Robert Speirs	DPI	20/04/2011
Final	Josephine Dessmann	Robert Speirs		16/05/2011

ABBREVIATIONS AND COMMON TERMS

DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (formerly Department of the Environment, Water, Heritage and the Arts)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
LEP	Local Environmental Plan
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Study Area	The area considered within this assessment which includes both direct and indirect areas of potential impact.
Subject Site	The area of land considered to be directly impacted as a result of the proposed works.
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 EXECUTIVE SUMMARY

Biosis Research Pty Ltd has been engaged by CIC Australia Limited (CIC) through the project management firm Manidis Roberts Pty Ltd to prepare a Flora and Fauna assessment of the impacts of a staged subdivision of the Googong township, south of Queanbeyan near Googong Dam, NSW. This report focuses on the potential impacts to flora and fauna as a result of the proposed Bulk Water Pumping Station, which is to provide potable (drinking) water for the township. The Bulk Water Pumping Station (the 'proposal') will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as part of the Googong township water cycle project. This report should be read in conjunction with the Googong water cycle project Terrestrial Flora and Fauna Assessment (Ecowise Environmental and Biosis Research 2009).

The proposed Bulk Water Pumping Station (BWPS) site is located within Commonwealth land currently leased by the ACT Government. The subject site for this BWPS has been re-located following recent consultation with ACTEW, ActewAGL and Queanbeyan City Council. The requests of all three parties resulted in the re-location of the BWPS to the western side of the existing ACTEW bulk water supply pipeline and the re-location of the proposed access route and potable water rising mains to outside of the area that ACTEW sub-leases from the Commonwealth for the water treatment plant. The re-location of the BWPS and access route, as assessed in this report, address the potential land tenure and access issues that were raised.

The re-location of the BWPS subject site also allows for the avoidance of three populations of Hoary Sunray listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These populations are established across the dirt access track to the north of the current subject site. The previous proposed subject site was located further upslope and required the existing dirt track to be upgraded to provide access to the BWPS. The re-location of the proposed BWPS site further south now avoids all individuals of Hoary Sunray within these nearby populations.

The subject site is located to the south of the 'Talpa' property and upslope and to the north-west of the existing Googong Water Treatment Plant (refer Figure 2). The subject site consists of a north-west facing rocky slope supporting disturbed woodland. Unformed dirt access tracks currently fragment the woodland and during the current survey there was a high cover of exotic species in some parts of the study area, particularly adjoining the existing access track.

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur: Scribbly Gum / Red Box / Apple Box Dry Forest; Blakely's Red Gum / Red Box / Apple Box Grassy Woodland; Acacia Regrowth; and, Maintained Eucalypt Open Woodland. A total of 81 flora species were recorded within the study area, comprised of 57 native species and 24 exotic species (Appendix 1).

The small area (approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland was surveyed in detail and determined as meeting the criteria for the White Box / Yellow Box / Blakely's Red Gum Woodland ecological community, listed as endangered pursuant to the NSW *Threatened Species Conservation Act 1995* (TSC Act) and critically endangered pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An Assessment of Significance prepared in accordance

with the EPBC Act found that provided the proposal will be designed and located in a manner which will not require the clearance or significant disturbance of this Endangered Ecological Community (EEC), the proposal is unlikely to significantly impact upon the EEC.

Given the known occurrence of Button Wrinklewort (*Rutidosia leptorrhynchoidea*) and Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) within the wider locality, targeted surveys for Hoary Sunray and Button Wrinklewort were conducted throughout the study area with no individuals of either species being recorded. It is noted that Hoary Sunray was in flower at the time of the survey and would have been prominent if it were to occur within the study area. In this regard, it is considered unlikely that the proposal would have any impact (significant or otherwise) upon Hoary Sunray and Button Wrinklewort. No other plant species listed as threatened pursuant to the EPBC Act and/or the TSC Act were recorded within the study area.

Fauna recorded in the study area during the current survey include 18 bird species and nine mammals (one introduced species) (Appendix 1). Two threatened species were detected on site, Speckled Warbler (*Chthonicola sagittata*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) both listed as Vulnerable under the TSC Act. A range of threatened fauna species have previously been recorded in the locality.

Part 3A Assessments of Significance were prepared for the following animal species: Speckled Warbler, Brown Treecreeper (*Climacteris picumnus victoriae*), Rosenberg's Goanna (*Varanus rosenbergi*), Eastern Bentwing-bat and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*). The assessments concluded that the proposal is considered unlikely to result in a major impact on these fauna species with known and/or potential habitat within the study area.

The assessment against the EPBC Act Significant Impact Criteria for the Box Gum Woodland EEC found that this community is unlikely to be significantly impacted by the proposed development and consequently a Referral under the provisions of the EPBC Act is not required.

While the proposal is considered unlikely to have a major impact on threatened species, populations or ecological communities, a number of recommendations have been made to ensure any potential impacts on the flora, fauna and biodiversity of the study area are minimised, including:

1. Avoid the introduction and transportation of weeds into surrounding areas of better quality vegetation. Measures that should be implemented to minimise the transportation of weeds include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland.
2. Where possible avoid the removal of and/or disturbance to termite mounds within the study area.
3. Avoid removal of hollow-bearing trees and branches in the study area. Where the removal of hollow-bearing trees and branches is found to be unavoidable, the work should be undertaken by an appropriately qualified arborist under the observation of a qualified ecologist/zoologist. Hollows should be inspected for resident fauna by a qualified ecologist/zoologist prior to felling or trimming. If resident fauna are found, the

appropriate action to follow should be determined in consultation with the qualified ecologist/zoologist.

4. Erosion, stormwater and runoff controls, consistent with NSW guidelines, will be required pre, during and post construction to prevent sedimentation in receiving waterways. This may include the appropriate use of temporary sediment fencing or sediment control bunding. These structures will need to meet appropriate standards and be well maintained throughout the construction phase.

2.0 INTRODUCTION

2.1 Project Description

The Googong Township is a new master-planned town for a population of some 16,000 people, south of Queanbeyan near Googong Dam, NSW. The vision is for a new, vibrant and sustainable community with an economic town centre and strong sense of place. It is the most significant urban development project undertaken by CIC Australia Limited (CIC) to date. The entire Googong proposal (not being assessed here) is for the development of five neighbourhoods, with schools, local shopping and employment opportunities. Each neighbourhood will be linked by parklands, with a total of more than 20% of the township dedicated to open spaces (CIC 2008). The Bulk Water Pumping Station is proposed as part of the water supply infrastructure for the township.

Biosis Research Pty Ltd has been engaged by CIC through the project management firm Manidis Roberts Pty Ltd to prepare a Flora and Fauna assessment of the impacts associated with the installation of the Bulk Water Pumping Station upon the immediate and surrounding area. This assessment considers all works associated with this proposal including the widening and improvement of an existing dirt track and creation of approximately 200m of new access road to service the Bulk Water Pumping Station.

The water cycle project, which is to support the subdivision, will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Ecowise Environmental and Biosis Research (2009) previously assessed the impacts to flora and fauna of the water reticulation project. The location of the Bulk Water Pumping Station, part of the water cycle project, has been revised and the new proposed location is outside the study area covered by the previous assessment. The current study focuses on the potential impacts on flora and fauna relevant to the construction of the currently proposed Bulk Water Pumping Station.

3.0 AIMS

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the proposed Bulk Water Pumping Station and associated access road at Googong, NSW.

The specific aims are to:

- Conduct a literature review and database search for the area surrounding the study site;
- Undertake targeted field surveys for habitat of threatened terrestrial flora and fauna (including populations and ecological communities) that are listed on the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and have been identified as potentially occurring in the area;
- Provide a brief assessment of the habitat values of the site;
- Preparation of Assessments of Significance (for threatened species listed on the TSC Act) and requirements for Referral (for threatened species listed on the EPBC Act) for significant flora and fauna, populations and ecological communities existing or potentially occurring in the study area; and,
- Provide recommendations to minimise the environmental impacts of the proposed development.

4.0 BACKGROUND

4.1 Description of Study Area and Surrounds

The study area occurs on Commonwealth land currently leased by the ACT Government. To the west, of the subject site is the 'Talpa' property. The Googong Dam Water Treatment Plant is upslope and to the east and south-east of the subject site. The subject site is largely bound by steep topography with slopes on the north, west and east of the site. The Queanbeyan River lies approximately 500m to the east and the suburbs of Karabar and Jerrabomberra lie to the north-west of the study area. The study area lies approximately 6km to the south of Queanbeyan, New South Wales (refer Figure 1).

4.1.1 Landform, topography and soils

The landscape of the study area is relatively steep and rocky. Slope elevations range from 650m in the north-east to 700m in the south-west, with gentler slopes at the crest of the hill adjoining the Googong Dam Water Treatment Plant (Jenkins 2000).

The geology of the local area consists of Silurian volcanics including the Colinton volcanics and the Cappanana Formation (Jenkins 2000). There are various tuffs with minor siltstone, shale, sandstone and limestone (Jenkins 2000). Soils within the study area are shallow, infertile, strongly acidic and moderately drained, with outcropping granite rock (Jenkins 2000).

Soils are shallow (less than 60cm) well drained lithosols and tensols (earthy sands) on the steep slopes. The steep slopes are subjected to mass movement hazards and minor to moderate sheet erosion. The crest and side slopes occur on moderately deep (less than 90cm) well drained red podzolic soils and yellow earths on crest and side slopes. The soils in the study area are acidic with low waterholding capacity and low fertility (Jenkins 2000).

4.2 Legislative Context

4.2.1 Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is a Commonwealth mechanism that requires proposed actions to be assessed in terms of their potential impact upon "Matters of National Environmental Significance" (MNES). MNES currently listed under the EPBC Act that are relevant to this project include:

- Threatened species and ecological communities; and,
- Migratory species.

Other matters that require assessment under the EPBC Act include where actions proposed are on, or will affect Commonwealth land and the environment. The study area occurs on Commonwealth land currently leased by the ACT Government and is also adjacent to the Googong Foreshores, which is Commonwealth Land.

Where a potential impact on a MNES or Commonwealth land is likely to occur as a result of a proposed action, the significance of that impact must be assessed. Guideline criteria for determining whether an impact is significant are provided under the Act. Where a proposed action will, or is likely to, have a significant impact, a Referral to the Commonwealth

Environment Minister must be prepared. The purpose of the Referral is to determine whether a proposed action requires approval and/or controls under the EPBC Act.

4.2.2 State

Environmental Planning and Assessment Act 1979

One objective of the EP&A Act is to encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats. A second objective is to encourage the principles of ecologically sustainable development, including the precautionary principle as defined under the *Protection of the Environment Administration Act 1991*.

Part 3A of the EP&A Act provides a single assessment and approval regime for major State infrastructure projects, development that previously was classified as State significant development and other projects, plans or programs declared by the Minister for Planning. The Director-General will prepare the environmental assessment requirements for the individual project after consulting with relevant public authorities, such as the Department of Environment Climate Change and Water (DECCW). Approved major projects are exempt from having to obtain various approvals normally required for developments, and are not required to prepare a Species Impact Statement (SIS). The Minister for Planning is the consent authority for all major projects and critical infrastructure assessed under Part 3A.

Threatened Species Conservation Act 1995

The TSC Act protects all threatened plants and animals native to NSW (with the exception of fish and marine plants). It provides for the identification, conservation and recovery of threatened species, populations and ecological communities. It also aims to reduce the threats faced by those species.

If a planned development or activity will have an impact on a threatened species, this must be taken into account in the development approval process. DECCW have prepared guidelines for the assessment of impacts on threatened species for projects being assessed under Part 3A of the EP&A Act (DEC & DPI 2005).

4.3 Definitions

The following terms are used frequently throughout the report:

- **The proposal** is the development, activity or action proposed. In this case the impacts associated with the construction of the Bulk Water Pumping Station, (water main) pipeline and access road are being assessed.
- **Subject site** is defined in *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC 2004b) and means the area directly affected by the proposal (i.e. development footprint plus a 5 m buffer).
- **Study area** is defined by DECC (DEC 2004b) as the subject site and any additional areas that are likely to be affected by the proposal. In this report, the study area refers to the area investigated by Biosis Research including areas likely to be directly and indirectly impacted (Figure 2).

- **Local population** is defined by DECC (DEC 2004b) as the population of a species within the study area. Potential impacts to a local population with potential habitat in the study area are considered in the context of known records and potential habitats within the locality (see below).
- **Locality** is the area within a 5 km radius of the study area.
- **Threatened biota** refers to threatened species, populations and ecological communities as listed on the TSC and EPBC Act.

5.0 METHODOLOGY

5.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report, plants are referred to by both their common name and scientific name in the first instance, and by their common name in subsequent references. Common and scientific names are included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (DEWHA 2009a). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

5.2 Literature and Database Review

Records of threatened species, populations and ecological communities were obtained from the DECCW Atlas of NSW Wildlife within a 10 km radius of the study area, using the Canberra 1:100 000 map sheet. Records for threatened species, populations and ecological communities listed on the EPBC Act were obtained from the DSEWPC EPBC Online Protected Matters Database within a 10km radius of the study area. Database searches were conducted in January 2011.

The study area and surrounding areas have previously been assessed for their ecological significance (Johnstone Centre 2004; Biosis Research 2009; Ecowise Environmental and Biosis Research 2009).

5.3 Flora Survey

Plant species and their habitat were surveyed by undertaking both habitat based assessments and targeted searches.

5.3.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- Species composition (species richness, degree of weed invasion); and,
- Vegetation structure (representation of each of the original layers of vegetation).

The four categories used to evaluate general habitat value were Good, Moderate, Poor and Unnatural as detailed below:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact.

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of

original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact.

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing.

Unnatural: highly modified landscape containing few or no indigenous species; exotic species dominant; original native vegetation layers removed; natural soil profile disturbed; unable to be regenerated to natural condition; high input intervention required to revegetate.

5.3.2 Targeted Surveys

A population of Hoary Sunray was recorded approximately 300m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species within close proximity to the study area, targeted surveys for Hoary Sunray were conducted throughout the study area.

5.4 Fauna Survey

5.4.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

Good: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native fauna.

Moderate: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna.

Poor: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native fauna.

Other habitat features such as the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structures were also used to assess habitat quality.

5.4.2 Survey technique and effort

Anabats (ultrasonic call recording device) were deployed at two locations within the study area targeting microchiropteran bat (microbat) species. These were directed at hollow-bearing trees within the study area. Anabat one was directed at a large stag just to the north of the study

area beyond the subject site. Anabat two was directed at a hollow-bearing Scribbly Gum (*Eucalyptus rossii*) located along a gully that runs through the subject site (refer Figure 6).

A dedicated bird transect was undertaken along the length of the subject site. This was undertaken for approximately 30 minutes along and adjacent to the existing access track (refer Figure 5).

Opportunistic observations of bird species were noted during the late afternoon of the 27th January, and morning to midday on the 28th January 2011.

Table 1 – Fauna survey effort

Survey Type	Traps/Locations	Effort
Anabat recording	Two Anabat detectors at separate locations over one night each.	Two nights
Diurnal Bird Surveys	Single transect within the study area.	30 min
Habitat Assessment & Incidental Records	Across the entire study area over the late afternoon of the 27 th January and morning/midday of the 28 th January 2011.	9 person hours on site

5.5 Limitations

Some plant species that occur in the local area are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial, but are inconspicuous unless flowering or in fruit. Furthermore, some animal species are only detectable at certain times of the year. Therefore, as the field surveys were conducted over a narrow time period, 27th and 28th January 2011, it is likely that some species that are present on the site were not detected. Despite these limitations, the assessment of impact is based on the presence or absence of suitable habitat for threatened flora and fauna and as such, species are taken into account during the assessment even though they may not have been detected during the survey. Previous surveys undertaken in the study area during 2009 and 2010 were reviewed and species recorded during these investigations were taken into account.

6.0 RESULTS

6.1 Literature Review

Biosis Research has previously undertaken a flora and fauna assessment for the development of the Bulk Water Pumping Station immediately adjacent and overlapping with the current study area. Reports documenting studies undertaken in the area include;

- Johnstone Centre (2004) 'Environmental Assessment Googong Urban Investigation Area.' Charles Sturt University, Wagga Wagga.
- Biosis Research (2009) 'Terrestrial fauna assessment for Googong Water Reticulation. Report prepared for Ecowise Environmental.' Biosis Research, Sydney.
- Ecowise Environmental and Biosis Research (2009) 'Googong Water Cycle Project - ecological assessments - flora and fauna. Report prepared for Canberra Investment Corporation.'
- Biosis Research (2010) Terrestrial Flora and Fauna Assessment Report for Bulk Water Pumping Station, Googong.
- Biosis Research (2010) 'Googong Township - Pink-tailed Worm Lizard (*Aprasia parapulchella*) Impact Assessment Report.'

This report considers a larger study area and subject site than the previous terrestrial Flora and Fauna Assessment Report to accommodate any minor future changes to the location design of the Bulk Water Pumping Station and associated works.

The previous Biosis Research flora and fauna assessment for the Bulk Water Pumping Station identified populations of Hoary Sunray plants within the proposed study area along the existing dirt track. This plant species is listed as endangered under the EPBC Act. All populations within the study area were mapped and the location and proposed access track to the Bulk Water Pumping Station was adjusted to avoid these populations. This report assesses the revised subject site and study area for the proposed Bulk Water Pumping Station and access track.

The previous Biosis Research flora and fauna assessment for the Bulk Water Pumping Station considered the Pink-tailed Worm-lizard (*Aprasia parapulchella*) to have potential habitat within the study area based on the proximity of previous records (1.5km to the south-west within the 'Talpa' property) (Johnstone Centre 2004).

Targeted surveys for Pink-tailed Worm-lizards were undertaken on the 2nd and 3rd November 2010 which included the current Bulk water Pumping Station study area (Biosis Research 2010). Survey weather conditions and timing were considered optimal. No Pink-tailed Worm-lizards were found within the Bulk Water Pumping Station study area. Previous potential habitat mapping undertaken by the Johnstone Centre (2004) also does not include any of the woodland habitats which extend into the current study area as potential habitat. For these reasons the current Bulk Water Pumping Station study area is not considered to provide habitat for Pink-tailed Worm-lizards.

The Johnstone Centre (2004) carried out environmental investigations in an area west of Googong Dam near Queanbeyan for inclusion in the Googong Urban Investigation Area Local Environment Study (LES). The study area for these investigations consisted of a number of private landholdings including the 'Talpa' property to the west of the current study area.

The Johnstone Centre carried out targeted surveys for threatened species including Pink-tailed Worm-lizards, Golden Sun Moth (*Synemon plana*), bats and birds (Johnstone Centre 2004). Reptile surveys found 17 Pink-tailed Worm-lizards. These were recorded on 'Talpa' (to the north-west of the current study area) and on the McLean property (to the west of the current study area). Pink-tailed Worm-lizards were also recorded at "Googong" south of the study area during 2009 and 2010 surveys conducted by Biosis Research (Biosis Research 2010).

The Golden Sun Moth was recorded on Crown land and on Robin Pty Ltd property to the west of the current study area. Unconfirmed sightings of Golden Sun Moth were made on 'Talpa'. Eastern Bentwing-bat and Eastern False Pipistrelle were recorded in the gully (Googong Creek) to the west of the study area. However, the confidences in identification for these species were considered 'possible' and 'probable' respectively for the Eastern Bentwing-bat and Eastern False Pipistrelle. Brown Treecreepers were recorded at a number of locations, including adjacent to the current study area (Johnstone Centre 2004).

Ecowise Environmental and Biosis Research (2009) assessed the impacts of the Googong Water Cycle project on flora and fauna. The study area for this previous assessment included a section of the Googong Foreshores, comprising the Googong Dam Road corridor, the roadway that leads to the Googong Water Treatment Plant and a section of land within the WTP. The revised Bulk Water Pumping Station location is to the north of the previous study area, and there is a small overlap in the study areas for both assessments. The small section of Googong Foreshores sampled by Ecowise Environmental and Biosis Research (2009) was regarded as heavily fragmented and not representing any particular vegetation community. The Endangered Ecological Community White Box / Yellow Box / Blakely's Red Gum Woodland was recorded adjoining Googong Creek, to the north of the current study area.

Assessments of Significance were carried out for a number of threatened species and EECs. It was concluded that a significant impact on EECs and threatened flora species was unlikely as a result of the proposed water cycle project, however, there could be a significant impact on the Pink-tailed Worm-lizard and the Golden Sun Moth (Ecowise Environmental and Biosis Research 2009). These two species were subsequently assessed in further detail in 2009, 2010 and 2011, concluding that there would be no significant impacts upon these species.

6.2 Vegetation Communities

6.2.1 Vegetation mapping

There has been limited regional vegetation mapping undertaken in the locality. The Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (Fallding 2002) provides modelling of broad vegetation types for the region. The study area and subject site are broadly mapped as Secondary Grassland (higher probability of occurrence), Dry Forest and Box-Gum Woodland. The subject site was largely mapped as Secondary Grassland (higher probability of occurrence).

Dry Forest is described as (p22):

Various forest ecosystems with trees occurring in a density of >30% canopy cover. Dominated by one or more of the following tree species: Red Stringybark, Red Box, Scribbly Gum, Brittle Gum, Broad-leafed Peppermint, Red Box, Bundy and Mealy Bundy. Understorey vegetation is often sparse and dominated by shrubs or tussock grass species such as Red-anthered Wallaby Grass. Occur on shallower soils and steeper slopes than those do that support grassy woodlands.

Box-Gum Woodland is described as (p21):

Grassy communities with a tree cover of between 10 - 30%. Dominant tree species include White Box, Yellow Box and Blakely's Red Gum, and some other species. Occur on the deeper soils of the footslopes and midslopes, and occasionally on upper slopes.

The accuracy of the mapping of this Dry Forest is stated by Fallding (2002) to be good, and of Box-Gum Woodland is stated to be fair to medium - this unit may include areas of exotic grassland.

Secondary Grassland is described as being derived from the clearing of woodland vegetation types, including Box-Gum Woodland.

The Johnstone Centre (2004) Local Environment Study (LES) mapped the vegetation communities of the Googong Urban Investigation Area. The north-western boundary of the study area adjoins the Googong Urban Investigation Area. The vegetation adjoining the study area is mapped as 'Box woodland and forest'.

6.2.2 Current Survey

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur; these vegetation communities are described below.

Scribbly Gum / Red Box / Apple Box Dry Forest

The vegetation community occurring throughout the majority of the less-disturbed sections of the study area consists of a generally intact dry forest to woodland with a canopy 8m to 16m in height, dominated by Scribbly Gum (*Eucalyptus rossii*), Red Box (*E. polyanthemos*) and Apple Box (*E. bridgesiana*), occurring in varying proportions. The midstorey, 1m to 5 m in height, is dominated by Burgan (*Kunzea ericoides*) and Native Blackthorn (*Bursaria spinosa*) and is very dense in patches. The groundstorey varies greatly throughout this vegetation community with some areas supporting a high dominance and diversity of native grasses and forbs, and others dominated by exotic shrubs and herbs encroaching from the more disturbed upslope land. The current disturbance to this vegetation community is limited to that associated with the past construction and maintenance of the existing unformed dirt access track.

Whilst the area of this vegetation community within the study area is in 'good to moderate' condition, the vegetation community is common throughout the wider locality (and Southern Tablelands) and thus, does not have specified conservation status pursuant to the EPBC Act

or the TSC Act. The fact that this vegetation community occurs on shallow, gravelly (and therefore infertile) soils has meant that it has not been subject to widespread clearance for agricultural purposes. Plate 1 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.



Plate 1 - Scribbly Gum / Red Box / Apple Box Dry Forest

Blakely's Red Gum / Red Box / Apple Box Grassy Woodland

A small patch of land (approximately 1210m²) occurring within the study area, generally surrounded by the above described Dry Forest, supports a moderately disturbed grassy woodland with a canopy 8m to 20m in height dominated by Blakely's Red Gum (*Eucalyptus blakelyi*) (10 mature trees), with Red Box and Apple Box occurring as subdominant components within the patch and dominant components in the surrounding areas. The sparse midstorey, 1m to 5m in height, consists of Burgan and Native Blackthorn. The groundstorey varies throughout this vegetation community: the areas associated with rocky outcrops support primarily native perennial grasses and forbs; and, the lower lying areas associated with the small drainage line and existing unformed dirt access track support a substantial component of exotic perennial and annual weeds. Overall, this vegetation community is considered to be in Good to Moderate condition. Plate 2 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.

Further to the above, a detailed survey was conducted to determine whether this vegetation community meets the criteria for the EEC White Box / Yellow Box / Blakely's Red Gum Woodland. The assessment process followed that provided in the Commonwealth '*EPBC Act Policy Statement – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands*' (DEH 2006). The results are provided below.

1. **Criteria** - *Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?*

Assessment result - Yes, Blakely's Red Gum is the most common overstorey species of this vegetation community.



2. **Criteria** - Does the patch have a predominantly native understorey?

Assessment result - Yes, the perennial understorey throughout the majority of the patch comprises in excess of 50 percent native species.



3. **Criteria** - Is the patch 0.1 ha (1000m²) or greater in size?

Assessment result - Yes, the patch is approximately 1210m² in area (determined via canopy boundary delineation, using a hand-held GPS unit, accurate +/- 3m).



4. **Criteria** - Are there 12 or more native understorey species present (excluding grasses). There must be at least one important species.

Assessment result - Yes, as detailed in Table 2 below, 21 native understorey species (excluding grasses) were recorded and 7 of these are important species.

Table 2 – Native understorey species (excluding grasses)

Scientific name	Common Name	Important Species
<i>Astroloma humifusum</i>	Native Cranberry	
<i>Bracteantha viscosa</i>	Sticky Everlasting	
<i>Bursaria spinosa</i>	Native Blackthorn	
<i>Centipeda cunninghamii</i>	Common Sneezeweed	
<i>Cheilanthes austrotenuifolia</i>	Rock Fern	
<i>Desmodium varians</i>	Slender Tick-trefoil	Yes
<i>Euchiton gymnocephalus</i>	Creeping Cudweed	
<i>Geranium solanderi</i>	Native Geranium	
<i>Glycine tabacina</i>	Glycine Pea	Yes
<i>Goodenia hederacea</i>	Ivy Goodenia	Yes
<i>Hibbertia obtusifolia</i>	Hoary Guinea-flower	Yes
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	
<i>Hypericum gramineum</i>	Small St John's Wort	Yes
<i>Kunzea ericoides</i>	Burgan	Yes
<i>Lepidosperma laterale</i>	Sword Sedge	
<i>Lomandra filiformis</i>	Wattle Mat-rush	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	
<i>Lomandra multiflora</i>	Many-flowered Mat-rush	
<i>Oxalis perennans.</i>	Grassland Wood Sorrel	
<i>Tricoryne elatior</i>	Yellow Autumn-lily	Yes
<i>Wahlenbergia communis</i>	Tufted Bluebell	

In accordance with the results of the above assessment, it is determined that this vegetation community meets the criteria for the EEC.

As detailed above, the small (i.e. approximately 1,210m²) patch of Blakely's Red Gum/Red Box/Apple Box Grassy Woodland was assessed and determined to support the size, floristic and structural characteristics required to meet the criteria for the White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands Endangered Ecological Community (EEC). This EEC is listed as 'Critically Endangered' pursuant to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and 'Endangered' pursuant to the NSW Threatened Species Conservation Act 1995 (TSC Act).



Plate 2 - Blakely's Red Gum / Red Box / Apple Box Grassy Woodland

Acacia Regrowth

The section of the study area located between the proposed 'new access track' and the Googong Dam Water Treatment Plant supports a highly disturbed vegetation community characterised by an absent canopy, a midstorey consisting of Black Wattle (*Acacia decurrens*) and Red-leaf Wattle (*A. rubida*) regrowth and an understorey dominated by exotic woody and herbaceous weeds, notably Blanket Weed (*Verbascum thapsus*), Apple of Sodom (*Solanum linnaeanum*), Skeleton Weed (*Chondrilla juncea*), Horehound (*Marrubium vulgare*), Paterson's Curse (*Echium plantagineum*), St John's Wort (*Hypericum gramineum*) and Blackberry (*Rubus fruticosus*). It appears that this vegetation community has colonised this area post clearance for the construction of existing water supply infrastructure. This vegetation community is considered to be Unnatural in condition and floristic composition. Plate 3 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.



Plate 3 - Acacia Regrowth

Maintained Eucalypt Open Woodland

The western section of the study area, generally located between the Googong Dam Water Treatment Plant and the Googong Foreshores Tourist Information Centre supports a highly disturbed open woodland community with areas of maintained (i.e. slashed areas) understorey. The canopy throughout this vegetation community supports scattered retained Eucalypt trees (primarily Scribbly Gum, Red Box, Apple Box and Red Stringybark (*Eucalyptus macrorhyncha*)) and various planted native trees. The understorey is largely cleared and supports scattered clumps of Black Wattle and Red-leaf Wattle regrowth. This vegetation community is considered to be in Unnatural in condition and floristic composition. Plate 4 provides a representative photograph of this vegetation community and the distribution of the vegetation community within the study area is presented on Figure 3.

The Acacia Regrowth and Maintained Eucalypt Open Woodland vegetation communities within the study area are highly disturbed (due primarily to past anthropological activities) and support exotic weed dominated groundstories. Such vegetation communities do not constitute any vegetation community with specific conservation status pursuant to the EPBC Act or the TSC Act.



Plate 4 - Maintained Eucalypt Open Woodland

6.3 Flora

A total of 81 vascular plant species were recorded from the study area, comprising 57 (70%) locally indigenous species and 24 (30%) exotic species. A list of plant species recorded is provided in Appendix 1.

Of the exotic species recorded, only Blackberry (*Rubus fruticosus*) is listed (Class 4) under the *Noxious Weeds Act 1993* and the *Noxious Weeds Amendment Act 2005* for the Queanbeyan LGA. The management requirements for Class 4 species (as specified by the NSW Department of Industry and Investment) are as follows:

The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

6.3.1 Significant Flora

A total of eight plant species listed on the TSC Act and/or EPBC Act, or their habitat, have been previously recorded within a 10km radius of the study area (Table 8 in Appendix 4; Figure 4).

As stated in Section 5.3.2, a population of the endangered species Hoary Sunray was recorded approximately 300 m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species close to the study area, targeted surveys for Hoary Sunray were conducted throughout the study area. No individuals of this species were recorded within the study area. Given that the species was in flower (and quite conspicuous) at the time that the surveys were conducted, it is considered that any plants located within the study area would have been readily identified. The study area may also represent potential habitat for the endangered species Button Wrinklewort, however the species was targeted and not recorded during the surveys.

6.4 Fauna

6.4.1 Fauna Habitats

Disturbed Woodland

Woodland habitat within the study area has been previously disturbed by construction of the Googong Water Treatment Plant and associated infrastructure (including tracks). Myrtaceaeous trees, mostly Eucalypt species (including *Eucalyptus polyanthemos*, *E. rossii* and *E. bridgesiana*) dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds. Several of the trees within the study area are hollow-bearing (Figure 7) which may provide habitat for a variety of fauna which depend upon hollows for nesting and shelter. The understorey is sparse with a mixture of shrubs and regenerating Eucalypts providing shelter and foraging habitat for small birds and mammals. The groundcover contains a mixture of both native and exotic grasses and forbs. Termite mounds are found at moderate densities throughout the study area. These are a critical habitat component for the vulnerable Rosenberg's Goanna which relies on the constant temperatures within the mounds for egg

incubation. A small area of dense revegetation occurs within the study area which small birds were found to forage in regularly.

Common species recorded during the survey included Crimson Rosellas (*Platycercus elegans*), Superb Fairy-wrens (*Malurus cyaneus*) and Striated Thornbills (*Acanthiza lineata*).

Box-Gum Woodland

A small patch of Box-Gum Woodland occurs within the study area. Large trees of Blakey's Red Gum Eucalypts provide food for fauna in the form of nectar, flowers and exudates. These large trees are also known to hollow readily providing habitat for a range of fauna which rely on hollows for nesting and roosting such as several microbat species, Ring-tailed Possums and hollow-nesting birds such as parrots.

In general the habitat within the study area is considered to be of Moderate value to fauna, being relatively intact and providing a range of foraging and breeding resources for a variety of species.

6.4.2 Fauna

Two threatened fauna species – Speckled Warbler and Eastern Bentwing-bat both listed as Vulnerable under the TSC Act – were recorded during the current survey. A possible Eastern Bentwing-bat call was recorded on one of the ultrasonic recording devices (Anabats) deployed. There is ambiguity associated with the identification of this call; it can not be confidently attributed to Eastern Bentwing-bat. However, previous surveys (Johnstone 2004) detected Eastern Bentwing-bat in the locality and although the study area does not provide any suitable roosting habitat for this species (e.g. caves, culverts, etc), in accordance with the Draft Threatened Species Survey and Assessment Guidelines (DEC 2004) this species has been assumed to occur onsite despite the lack of certainty in identification. Fauna recorded in the current surveys are listed in Appendix 1 and include 18 birds and nine mammals (one introduced).

6.4.3 Significant fauna

A total of 36 threatened and/or migratory animal species or their habitat have been previously recorded within a 10km radius of the study area (DECCW Atlas of NSW Wildlife and DSEWPC Online EPBC Database). Of these, 27 animal species are listed under the TSC Act and 21 animal species are listed under the EPBC Act (13 animal species are listed under both Acts). 26 threatened and/or migratory animal species have been previously recorded within a 10km radius of the study area (refer Figure 5).

Two threatened animal species, Speckled Warbler and Eastern Bentwing-bat, both listed as Vulnerable under the TSC Act, were recorded during the current survey. Known and/or potential habitat for 15 threatened and/or migratory species listed on the TSC and EPBC Acts does occur within the study area (Table 7 in Appendix 4). These species are White-bellied Sea-eagle (*Haliaeetus leucogaster*), White-throated Needletail (*Hirundapus caudacutus*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Brown Treecreeper, Satin Flycatcher (*Myiagra cyanoleuca*), Regent Honeyeater (*Anthochaera phrygia*), Rainbow Bee-eater (*Merops ornatus*), Speckled Warbler, Diamond Firetail (*Stagonopleura guttata*), Hooded Robin (*Melanodryas cucullata cucullata*), Swift Parrot (*Lathamus discolor*), Spotted-tailed Quoll (*Dasyurus maculatus maculatus*), Eastern False Pipistrelle, Eastern Bentwing-bat and

Rosenberg's Goanna. These species have been considered further in Section 7.0 (Impact Assessment) of this report.

7.0 IMPACT ASSESSMENT

7.1 Extent of Impacts

7.1.1 Introduction

Impacts arising from the proposal include disturbance and clearing of approximately 3ha of a varying mosaic of Grassy Woodland / Dry Forest vegetation. The proposed access road will include widening the existing unformed dirt track and creating a new length of all-weather access track diverging from this existing track to provide access to the proposed Bulk Water Pumping Station. The site of the Bulk Water Pumping Station will have a concrete slab measuring approximately 10m by 25m on which the Bulk Water Pumping Station would be constructed in stages. Underground pipes will follow the length of the road to connect to the Bulk Water Pumping Station. The pipes are expected to measure 225mm and 450mm in diameter and extend approximately 1,350m.

7.1.2 Key Threatening Processes

This section of the report has been provided in order to give specific contextual information regarding potential impacts considered to result from the proposal. The extent of the following impacts on each species and community would vary. Assessments of the likely impacts on each species are provided in Appendix 2. A range of Key Threatening Processes (KTPs) may result from the proposal; however the most likely are clearing of native vegetation, bushrock removal, loss of hollow-bearing trees and removal of dead wood and dead trees. These are discussed in more detail below.

Clearing of vegetation and associated habitat loss

‘Clearing of native vegetation’ is listed as a Key Threatening Processes (KTP) under Schedule 3 of the TSC Act; ‘Land clearance’ is listed as a KTP under the EPBC Act; and, clearing of native vegetation is also subject to the *Native Vegetation Act 2003* (NV Act). Impacts of the clearing of native vegetation on biological diversity include:

- Destruction of habitat resulting in the loss of local populations of individual species;
- Fragmentation;
- Expansion of dryland salinity;
- Riparian zone degradation;
- Increased habitat for invasive species;
- Loss of leaf litter layer;
- Loss or disruption of ecological function; and,
- Changes to soil biota.

Approximately 3ha of disturbed Grassy Woodland / Dry Forest will be potentially impacted as a result of the proposal. Not all of this area will be permanently cleared, however, there may be vegetation disturbance during construction. The major impact on habitat values will be the removal or disturbance of approximately 3ha of existing habitat for the construction of the Bulk Water Pumping Station and an approximately 5m wide access road with pipeline main

embedded beneath (within a 20m subject site corridor). It is considered unlikely that the proposal will result in significant fragmentation of habitat within the study area. The approximate area to be cleared of each of the vegetation communities associated with the Grassy Woodland / Dry Forest are given below.

Vegetation Community	Approximate area of clearance (Ha)
Maintained Eucalypt Open Woodland	1.09
Acacia Regrowth	0.46
Blakely's Red Gum/Red Box/Apple Box Grassy Woodland	0
Scribbly Gum/Red Box/Apple Box Dry Forest	1.48

Removal of Bushrock

'Removal of bushrock' is listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2007a). Bushrock Removal is the removal of natural surface deposits of rock from rock outcrops or from areas of native vegetation. Bushrock removal does not include: the removal of rock from approved quarrying activities; the salvage of rock where the removal of the rock is necessary for carrying out an approved development or the removal of rock from paddocks when it constitutes a necessary part of a routine agricultural activity (NSW Scientific Committee 2007a).

Loss of hollow-bearing trees and removal of dead wood and dead trees

'Loss of hollow-bearing trees' is listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2007b). In NSW, terrestrial vertebrate species that are reliant on tree hollows for shelter and/or nests include at least 46 mammals, 81 birds, 31 reptiles and 16 frogs (Gibbons and Lindenmayer 1997; Gibbons and Lindenmayer 2002). Of these, 40 species are listed as threatened under the TSC Act (NSW Scientific Committee 2007b).

Hollow-bearing trees in the subject site are likely to provide suitable den and nesting habitat for a range of common birds (such as parrots) and possibly arboreal mammal species (such as Common Brush-tailed Possums (*Trichosurus vulpecular*)). Locally recorded threatened species requiring tree hollows for roosting include Brown Treecreepers and Gang-gang Cockatoos. Up to 16 hollow-bearing trees may be removed as a result of the proposal. Retention of hollow-bearing trees where possible is encouraged to reduce impacts on species that rely on them for breeding.

'Removal of dead wood and dead trees' is also listed as a KTP under Schedule 3 of the TSC Act (NSW Scientific Committee 2003). The removal of standing dead wood reduces the availability of hollows over time and the input of material to the litter layer (NSW Scientific Committee 2003). Fallen branches and bark provide refuge and nesting habitat for a range of terrestrial animals. Many invertebrates and amphibians rely on these 'moisture-retaining' microhabitats to over-winter or as refuge during periods of drought. Similarly, many reptiles rely on ground litter and debris for shelter and foraging.

7.2 Part 3A Assessment of Impacts

7.2.1 Introduction

The impacts of the proposal on threatened biota listed under the TSC Act have been undertaken following the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (DEC & DPI 2005). Where threatened biota is recorded within a study area, an impact assessment is required under the EP&A Act. When threatened biota is not recorded during a survey, the presence of potential habitat for this species is used to determine the need to undertake an impact assessment under the EP&A Act. Where there is no potential habitat in the study area for threatened biota, there is unlikely to be any impact on these species and therefore these species are not required to be considered further.

7.2.2 Assessment of Key Thresholds

The Part 3A Guidelines of the EP&A Act (DEC & DPI 2005) set out a number of key thresholds which need to be addressed to justify the impacts of the proposal on threatened species, populations or ecological communities. The key thresholds are:

- Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, will maintain or improve biodiversity values;
- Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community;
- Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction; and,
- Whether or not the proposal will adversely affect critical habitat.

7.2.3 Maintenance of Biodiversity Values

No threatened species, populations or communities are considered to be subject to a major impact as a result of the proposal. During the initial planning stages, the access road, pipeline and Bulk Water Pumping Station were proposed to be located in proximity to threatened species or EECs (i.e. Hoary Sunray or Blakely's Red Gum/Red Box/Apple Box Grassy Woodland). However, the development proposal design has been substantially modified to avoid impact to these biodiversity assets of high conservation value. Through these efforts the proposed works have endeavoured to maintain biodiversity values of the site and therefore biodiversity offsets are not considered necessary.

The subject site is currently disturbed with piled boulders and soil observed adjoining the existing access track and high cover of exotic species in some areas, particularly adjoining the track and in the area downslope of the Googong Water Treatment Plant. The proposed clearing of vegetation occurs along an existing access track where the native vegetation is in highly variable condition, subject to weed infestation and disturbance associated with the existing access track.

The proposed Bulk Water Pumping Station and associated access road will require the clearing and disturbance of approximately 3ha of intact to highly disturbed Dry Forest / Grassy Woodland. This vegetation community is currently fragmented by a number of access tracks,

and it is likely to be further fragmented by the construction of the proposed access road. Provided that the mitigation measures detailed in Section 8.0 are implemented, the proposed development is likely to maintain the biodiversity values of the locality.

7.2.4 Potential Impacts on Endangered Ecological Communities (EEC's)

A small area (approximately 1210m²) of the study area supports Blakely's Red Gum / Red Box / Apple Box Grassy Woodland which meets the floristic and structural criteria for the ecological community White Box / Yellow Box / Blakely's Red Gum Woodland listed as endangered pursuant to the NSW TSC Act (the EEC is also listed as critically endangered under the EPBC Act). The proposed access road (and associated disturbance area) will be located and designed in a manner that will not require any significant disturbance to this EEC. Nevertheless, it is recognised that the EEC is located within the study area for the proposal and thus within close proximity to the proposed disturbance areas.

An Assessment of Significance following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (DEWHA 2009b) has been carried out regarding the potential impacts of the proposal on the patch of this EEC located in the study area (refer Appendix 3).

With reference to the above, it is noted that the impact assessment criteria for EEC's under the EPBC Act are largely equivalent to, and largely more thorough than, those provided under the NSW TSC Act (i.e. Part 3A Assessment). In this regard, the impact assessment provided in Appendix 3 is considered an appropriate assessment of impacts as relevant to both the EPBC Act and the TSC Act.

7.2.5 Key Thresholds and potential impacts to Threatened Flora

No threatened plant species as listed under the NSW TSC Act were recorded in the study area.

One threatened plant species listed on the TSC Act, Button Wrinklewort, is considered to have potential habitat in the study area but was not recorded during the current surveys of the study area, or during previous surveys of the study area and locality (The Johnstone Centre 2004, Biosis Research 2010b). The nearest known record of this species is approximately 2.5km south of the study area in the proximity of Googong Reservoir (refer Figure 4). Button Wrinklewort occurs in Box-Gum Woodland, secondary grassland derived from the clearance of Box-Gum Woodland and in Natural Temperate Grassland. The limitation of the distribution of this species to these EECs has largely resulted in the decline of the species in line with the decline of the EECs. Potential habitat (comprised of these EECs) occurs in patches throughout the wider locality, however no detailed mapping of the occurrence of these EECs throughout the wider locality has been completed.

Potential impacts upon the species were considered as a small patch of Blakely's Red Gum/Red Box/Apple Box Grassy Woodland (i.e. Box-Gum Woodland) occurs within the study area. Given the intensity at which this small patch of the EEC was surveyed during this study, it is highly unlikely that the species was present and not recorded. The survey was completed at a time of year (i.e. summer) when the species would have been in flower, and thus, readily identifiable.

Whilst the potential for Button Wrinklewort to be present as dormant stems or within a soil stored seed bank within this small patch of EEC is feasible, it is considered highly unlikely.

Furthermore, should this be the case, the proposed alignment of the access track and pipelines has been designed in a manner which will not substantially impact upon the patch of EEC, and thus, will have not substantially impact upon any of the flora occurring within.

Further to the above, impacts to the potential habitat of this species are considered negligible due to the following:

- Impacts resulting from the proposal will be contained to a relatively small area of potential habitat (3ha) and extensive areas of potential habitat will be retained in the study area and locality;
- The proposal will not result in the isolation or fragmentation of potential habitat;
- The proposal is unlikely to interfere with the pollination and dispersal of native plant species; and,
- The proposal is unlikely to interfere with the existing fire regimes of the study area.
- On the basis of the above, detailed impact assessments for Button Wrinklewort are not considered necessary for this species, and as such, the species has not been considered further.

7.2.6 Key Thresholds and potential impacts to Threatened Fauna

The direct impacts of the proposal on potential fauna habitats include the removal of trees and disturbance of ground cover. Indirect impacts such as sediment runoff and increased weed invasion are likely to occur. Recommendations have been included within this report to minimise the potential for impacts on fauna habitats within the study area.

Table 3 below provides a brief discussion for each of the key thresholds that relate to threatened fauna with potential habitat in the study area. In accordance with the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act, the proposal is unlikely to reduce the long-term viability of, accelerate the extinction of and/or adversely affect critical habitat for threatened species, populations and/or ecological communities within the study area.

Table 3 – Key Thresholds for Threatened Fauna

Threatened Fauna	Will the proposal reduce the long-term viability of a local population of the species?	Will the proposal accelerate the extinction of the species or place it at risk of extinction?	Will the proposal adversely affect critical habitat?
Birds			
Diamond Firetail	Unlikely. Habitat to be removed is not considered limiting for this species.	Unlikely	No
Brown Treecreeper	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Speckled Warbler	Unlikely. Habitat to be removed is not considered limiting for this species. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Hooded Robin	Unlikely. Habitat to be removed is not considered limiting for this species.	Unlikely	No
Gang-gang Cockatoo	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. However, no records for this species occur within the locality.	Unlikely	No
Swift Parrot	Unlikely. No preferred foraging habitat will be removed as a result of the proposal and no records for this species occur within 10 km of the study area.	Unlikely	No
Regent Honeyeater	Unlikely. No preferred foraging habitat will be removed as a result of the proposal and no records for this species occur within 10 km of the study area.	Unlikely	No
Mammals			
Spotted –tailed Quoll	Unlikely. Some woodland habitat will be impacted, however this habitat along existing access roads is unlikely to provide optimal foraging habitat for this species.	Unlikely	No
Eastern False Pipistrelle	Unlikely. Some habitat will be removed including tree hollows potentially used for breeding. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Eastern Bentwing-bat	Unlikely. No limiting habitat such as preferred roosting or breeding sites are expected to be impacted as a result of the proposal. Refer to Part 3A Assessment in Appendix 2.	Unlikely	No
Reptiles			
Rosenberg's Goanna	Unlikely. Some woodland habitat will be impacted, however this habitat along existing access roads is unlikely to provide optimal foraging habitat for this species. Some small termite mounds occur within the subject site. Refer to Part 3A Assessment in Appendix 2.	Unlikely	Some termite mounds may be removed as a result of the proposal. Termite mounds are considered a critical habitat feature for the Rosenberg's Goanna.

Where there is potential habitat (foraging or breeding resources) for threatened species in the study area, further consideration must be given to the potential impact of the proposal on these species. The proposal may impact on threatened species by causing any of the following:

- Death or injury of individuals;
- Loss or disturbance of limiting foraging resources; and/or,
- Loss or disturbance of limiting breeding resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However, for some species, limiting resources include specialised foraging habitats that have a restricted distribution (such as Golden Sun Moths feeding only on the rootstock of specific native grass species).

Actual or potential habitat exists within the study area for a total of eleven threatened animal species listed on the TSC Act (Table 7, Appendix 2). Table 4 below summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment following the Part 3A Impact Assessment guidelines. Five species: Speckled Warbler, Brown Treecreeper, Rosenberg's Goanna, Eastern Bentwing-bat and Eastern False Pipistrelle, require further assessment due to the potential for impacts to limited foraging and/or breeding habitat, or due to being recorded during the current survey. Impact assessments using the Part 3A Assessment Guidelines Criteria have been prepared for the five threatened species and are provided in Appendix 2. The remaining six threatened species with potential habitat in the study area have not been considered further, as limiting resources would not be impacted by the proposal (Table 4).

Table 4 Potential Impacts on Threatened Fauna

Common Name	EPBC Act	TSC Act	Potential Impacts on Threatened Species			Impact Assessment required?	Reasoning
			Individual death or injury?	Loss or disturbance of limiting foraging resources?	Loss or disturbance of limiting breeding resources?		
Birds							
Diamond Firetail	-	V	No	No	No	No	Habitat within the study area is not considered limiting for this species, given the species' mobility and small area of habitat loss/modification. As such this species is not considered further
Brown Treecreeper	-	V	No	No	Yes	Yes	Potential breeding habitat in the form of small tree hollows may be modified and/or removed as a result of the proposal. A Part 3A Assessment is provided in Appendix 2.
Speckled Warbler	-	V	No	No	No	Yes	This species was observed foraging on site. For this reason a Part 3A Assessment has been prepared for this species (Appendix 2).
Hooded Robin	-	V	No	No	No	No	Habitat within the study area is not considered limiting for this species, given the species' mobility and small area of habitat loss/modification. As such this species is not considered further
Gang-gang Cockatoo	-	V	No	No	No	No	No tree hollows of suitable size for the Gang-gang Cockatoo are expected to be removed as a result of the proposal. Foraging habitat within the study area is not considered limiting for this species, given the species' mobility and small area of habitat loss/modification. As such this species is not considered further
Swift parrot	E	E1	No	No	No	No	No records for this species occur within 10 km of the study area and no preferred foraging resources will be removed. As such, this species is not considered further.
Regent Honeyeater	E	E1	No	No	No	No	No records for this species occur within 10 km of the study area. This species is unlikely to breed in the locality, and no limiting foraging resources will be removed. As such, this species is not considered further.

Common Name	EPBC Act	TSC Act	Potential Impacts on Threatened Species			Impact Assessment required?	Reasoning
			Individual death or injury?	Loss or disturbance of limiting foraging resources?	Loss or disturbance of limiting breeding resources?		
Mammals							
Spotted - tailed Quoll	E	V	No	No	No	No	The study area contains potential foraging habitat and adjacent and surrounding woodland may contain potential den sites. However given the extent of foraging habitat within the immediate vicinity of the study area, mobility of this species and small area to be disturbed, this species is not considered further.
Eastern False Pipistrelle	-	V	Unlikely	No	Yes	Yes	This species has previously been recorded in proximity to the study area (Ecowise & Biosis Research 2009). Due to the removal of tree hollows which are considered a limiting resource for this species, a Part 3A Assessment has been prepared for the Eastern False Pipistrelle (Appendix 2).
Eastern Bentwing-bat	-	V	No	No	No	Yes	This species was possibly recorded on the Anabat during the field survey. Despite the ambiguity in the identification of this species, and the lack of preferred breeding and roosting habitat in the region, in accordance with the Guidelines for Threatened Species Assessment under Part 3A of the EP&A Act (DEC & DPI 2005), this species has been assumed to be present within the study area and a Part 3A Assessment has been prepared (Appendix 2).
Reptiles							
Rosenberg's Goanna	-	V	No	No	Yes	Yes	Foraging habitat within the study area is not considered limiting for this species. Given the large home ranges and this species' mobility the small area of foraging habitat to be disturbed is unlikely to impact Rosenberg's Goanna. Some termite mounds occur within the subject site which this species may use for incubation. The proposal may impact some termite mounds but will avoid these habitat features where possible. A Part 3A Assessment is provided in Appendix 2.

7.3 EPBC Act Assessments of Significance

7.3.1 Endangered Ecological Communities (EEC's)

A small area (approximately 1210m²) of the study area supports Blakely's Red Gum / Red Box / Apple Box Grassy Woodland. This woodland meets the floristic and structural criteria for the ecological community White Box / Yellow Box / Blakely's Red Gum Grassy Woodland and Derived Native Grasslands, listed as critically endangered pursuant to the EPBC Act. The proposed access road (and associated disturbance area) will be located and designed in a manner that will not require any significant disturbance to this EEC. Nevertheless, it is recognised that the EEC is located within the study area for the proposal and thus within close proximity to the proposed disturbance areas. As such, an Assessment of Significance following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Commonwealth of Australia 2008) has been carried out regarding the potential impacts of the proposal on the patch of this EEC located in the study area (refer Appendix 3).

7.3.2 Threatened Flora Species

No threatened plant species as listed under the EPBC Act were recorded within the study area. Button Wrinklewort and Hoary Sunray are considered to have potential habitat in the study area however neither species was recorded during the current surveys of the study area.

As stated in Section 5.3.2, a population of Hoary Sunray was recorded approximately 300m to the east of the study area during flora surveys conducted in April 2010 (Biosis Research 2010b). Given the known occurrence of the species within the wider locality, targeted surveys for Hoary Sunray were conducted throughout the study area. No individuals of this species were recorded within the study area. Given that the species was in flower (and quite conspicuous) at the time that the surveys were conducted, it is considered that the any plants located within the study area would have been readily identified.

The potential for Button Wrinklewort or Hoary Sunray to be present as dormant stems or within a soil stored seed bank in the study area is feasible; however, if present in the soil, the proposal would have a negligible impact. Further to this, impacts to the potential habitat of these species is considered negligible due to the following:

- Impacts resulting from the proposal will be contained to a relatively small area of potential habitat (3ha) and extensive areas of potential habitat will be retained in the study area and locality;
- The proposal will not result in the isolation or fragmentation of potential habitat;
- The proposal is unlikely to interfere with the pollination and dispersal of native plant species; and,
- The proposal is unlikely to interfere with the existing fire regimes of the study area.

On the basis of the above, detailed impact assessments for Button Wrinklewort and Hoary Sunray are not considered necessary, and as such, the two species have not been considered further.

7.3.3 Threatened Fauna Species

Actual or potential habitat exists within the study area for a total of three threatened animal species listed on the EPBC Act (Table 7, Appendix 4). Table 4 above summarises the possible impacts from the proposal on these threatened fauna, and determines the need for further assessment following the Part 3A Impact Assessment guidelines. These three threatened species (Swift Parrot, Regent Honeyeater and Spotted-tailed Quoll) have not been considered further, as potential habitat would not be significantly impacted by the proposal (Table 4). Consequently no Assessments of Significance following the EPBC Significant Impact Criteria have been prepared.

7.3.4 Migratory Species

The list of migratory species under the EPBC Act is a compilation of species listed under four international conventions: China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Ten species listed under the ‘migratory’ provisions of the EPBC Act were listed in Table 7 (Appendix 4) for investigation. Of these, the following have potential habitat in the study area: White-throated Needletail, White-bellied Sea-eagle, Rainbow Bee-eater and Satin Flycatcher. Individuals of these species that have been or may be recorded in the study area are not considered likely to be an ecologically significant proportion of the population. Potential habitat in the study area is not considered important¹ for these migratory species. Minimal impact is expected on the potential habitat for these species in the study area. As such, no Assessments of Significance have been carried out for these species, in accordance with the Significant Impact Criteria (DEWHA 2009b).

7.3.5 Commonwealth Land

Under the EPBC Act, approval is required for an action taken by any person on or outside of Commonwealth land that is likely to have a significant impact on the environment on Commonwealth land. ‘Environment’ is defined in the EPBC Act as:

- a. Ecosystems and their constituent parts including people and communities (‘ecosystem’ is defined in the EPBC Act as ‘a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit’);
- b. Natural and physical resources;
- c. Qualities and characteristics of locations, places and areas;
- d. Heritage values of places; and,
- e. The social, economic and cultural aspects of a thing mentioned in paragraphs (a), (b) or (c).

¹ Where ‘important’ habitat for a migratory species is defined in DEWHA (2009b).

The study area is located on Commonwealth land currently leased by the ACT Government. Whether or not a significant impact on the environment is likely by the proposal has been assessed according to the former Department of Environment, Water, Heritage and the Arts (DEWHA) *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies Significant impact guidelines 1.2 Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010), in conjunction with *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2009b). The proposal is considered unlikely to result in a significant impact on the environment on Commonwealth land and as such, a Referral to the DSEWPC is not recommended.

8.0 RECOMMENDATIONS

The following recommendations have been made to reduce the impact of the proposal on native flora and fauna occurring in the study area:

1. Avoid the introduction and transportation of weeds into surrounding areas of better quality vegetation. Measures that should be implemented to minimise the transportation of weeds include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into any areas of bushland;
2. Where possible avoid the removal and/or disturbance of termite mounds throughout the study area;
3. Avoid removal of hollow-bearing trees and branches in the study area. Where the removal of hollow-bearing trees and branches is found to be unavoidable, the work should be undertaken by an appropriately qualified arborist under the observation of a qualified ecologist/zoologist. Hollows should be inspected for resident fauna by a qualified ecologist/zoologist prior to felling or trimming. If resident fauna are found, the appropriate action to follow should be determined in consultation with the qualified ecologist/zoologist; and,
4. Erosion, stormwater and runoff controls, consistent with NSW guidelines, will be required pre, during and post construction to prevent sedimentation in receiving waterways. This may include the appropriate use of temporary sediment fencing or sediment control bunding. These structures will need to meet appropriate standards and be well maintained throughout the construction phase.

9.0 CONCLUSION

This report assesses the ecological significance of threatened terrestrial flora, fauna and ecological communities that occur, or have the potential to occur, within the area to be impacted upon by the construction of the proposed Bulk Water Pumping Station and associated access road, in accordance with the requirements of the EP&A, TSC and EPBC Acts.

The study area supports a mosaic of Grassy Woodland / Dry Forest, varying in both floristic composition and degree of disturbance along its length. Within this mosaic, four discernable vegetation communities occur: Scribbly Gum / Red Box / Apple Box Dry Forest; Blakely's Red Gum / Red Box / Apple Box Grassy Woodland; Acacia Regrowth; and, Maintained Eucalypt Open Woodland. A total of 81 flora species were recorded within the study area, comprised of 57 native species and 24 exotic species.

The small area (approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland was surveyed in detail and determined to meet the criteria for the White Box / Yellow Box / Blakely's Red Gum Woodland ecological community, listed as endangered pursuant to the TSC Act and critically endangered pursuant to the EPBC Act. Assessments of Significance prepared in accordance with the NSW EP&A Act and the EPBC Act found that provided the proposal will be designed, located and managed in a manner which will not require the clearance or significant disturbance of this EEC, the proposal is unlikely to significantly impact upon the EEC and a Referral under the EPBC Act is not required.

Given the known occurrence of the species within the wider locality, targeted surveys for Hoary Sunray and Button Wrinklewort were conducted throughout the study area with no individuals of either species being recorded. In this regard it is considered unlikely that the proposal would have any impact (significant or otherwise) upon Hoary Sunray and Button Wrinklewort. Nearby populations of Hoary Sunray were in flower during the time of the survey and would have been prominent if they were to occur within the study area. No other threatened plant species listed pursuant to the TSC Act and/or the EPBC Act were recorded within the study area.

Potential impacts from the proposal are likely to be minimal. The direct impacts resulting from the proposal involve clearing and disturbance of approximately 3ha of Grassy Woodland / Dry Forest. Given the disturbed nature of much of the study area, extent of habitat within the wider locality, and nature of the proposal, the proposal is unlikely to result in the death or injury of individuals, loss or disturbance of limiting foraging resources and/or loss or disturbance of limiting breeding resources for the majority of threatened animal species.

The study area contains potential habitat for 15 threatened and/or migratory animal species. Of these 15 species, five required further assessment of impacts of the development due to loss of potential limiting foraging and/or breeding habitat, or due to their known presence in the study area; namely Speckled Warbler, Eastern False Pipistrelle, Eastern Bentwing-bat, Brown Treecreeper and Rosenberg's Goanna. The proposal is considered unlikely to have a major impact on any of these species.

With regard to the above, the proposal is considered unlikely to have a major impact on threatened species, populations or ecological communities listed under the TSC and/or the EPBC Acts. A Species Impact Statement (TSC Act) or a Referral (EPBC Act) is not considered necessary for any threatened or migratory flora or fauna as a result of the proposal.

A range of mitigation measures have been proposed to reduce the impacts of the proposal on biodiversity.

APPENDIX 1

Flora and Fauna Survey Results

Fauna Survey Results

Table 5 – Fauna species recorded on site

Family Name	Scientific name	Common Name	Observation Type
Birds			
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	O
	<i>Aquila audax</i>	Wedge-tailed Eagle	O
Artamidae	<i>Strepera graculina</i>	Pied Currawong	W
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	O
Corvidae	<i>Corvus coronoides</i>	Australian Raven	OW
Dicruridae	<i>Rhipidura albiscapa</i>	Grey Fantail	OW
	<i>Rhipidura leucophrys</i>	Willie Wagtail	W
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	W
Meliphagidae	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	O
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	OW
Pardalotidae	<i>Chthonicola sagittata</i>	Speckled Warbler	O
	<i>Pardalotus punctatus</i>	Spotted Pardalote	W
Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin	W
Psittacidae	<i>Platycercus elegans</i>	Crimson Rosella	OW
Mammals			
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit*	I
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O
Molossidae	<i>Mormopterus sp 2</i>	Freetail bat	AP
	<i>Mormopterus sp 4</i>	Inland freetail bat	AD
	<i>Tadarida australis</i>	White-striped Freetail Bat	AD
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	AD
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	AP
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	AP
	<i>Nyctophilus sp.</i>	long-eared bat	AM
	<i>Vespadelus darlingtoni</i>	Large Forest Bat	AP
	<i>Vespadelus sp</i>	Vespadelus	AM
	<i>Vespadelus vulturnus</i>	Little Forest Bat	AD

Key: Species in bold are listed as Vulnerable under the TSC Act and were recorded during the current survey.

*: introduced species O: Observed; OW: Seen and Heard; W: Heard; I: Incidental (scats, tracks, bones, etc), AD: Confidence in Anabat recording identification is definite; AP: Confidence in Anabat recording identification is probable; and, AM: Confidence in Anabat recording identification is possible.

Flora Survey Results

Table 6 – Flora species recorded on site

Note: * indicates exotic species

Family Name	Scientific name	Common Name
Adiantaceae	<i>Cheilanthes sieberi</i>	
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort
Asclepiadaceae	* <i>Tweedia coerulea</i>	
Asteraceae	* <i>Arctotheca calendula</i>	Capeweed
	<i>Bracteantha viscosa</i>	Sticky Everlasting
	<i>Cassinia longifolia</i>	
	<i>Cassinia quinquefaria</i>	
	<i>Centipeda cunninghamii</i>	Common Sneezeweed
	* <i>Chondrilla juncea</i>	Skeleton Weed
	<i>Chrysocephalum apiculatum</i>	Common Everlasting
	* <i>Cirsium vulgare</i>	Spear Thistle
	* <i>Conyza bonariensis</i>	Fleabane
	<i>Cymbonotus lawsonianus</i>	Austral Bears-ear
	<i>Euchiton gymnocephalus</i>	Creeping Cudweed
	* <i>Hypochaeris radicata</i>	Catsear
	* <i>Lactuca serriola</i>	Prickly Lettuce
	* <i>Tolpis umbellata</i>	Yellow Hawkweed
	<i>Vittadinia cuneata</i>	Fuzzweed
	<i>Vittadinia muelleri</i>	
Boraginaceae	* <i>Echium plantagineum</i>	Paterson's Curse
Brassicaceae	* <i>Hirschfeldia incana</i>	Buchan Weed
	* <i>Lepidium africanum</i>	
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell
Caryophyllaceae	* <i>Petrorhagia nanteuillii</i>	Proliferous Pink
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort
Cyperaceae	<i>Lepidosperma laterale</i>	
Dilleniaceae	<i>Hibbertia obtusifolia</i>	Hoary Guinea-flower
Epacridaceae	<i>Astroloma humifusum</i>	Native Cranberry
	<i>Lissanthe strigosa</i>	Peach Heath
	<i>Melichrus urceolatus</i>	Urn Heath

Family Name	Scientific name	Common Name
Fabaceae (Faboideae)	<i>Bossiaea buxifolia</i>	
	<i>Desmodium varians</i>	Slender Tick-trefoil
	<i>Glycine tabacina</i>	Glycine Pea
	<i>Hardenbergia violacea</i>	False Sarsaparilla
Fabaceae (Mimosoideae)	<i>Acacia decurrens</i>	Black Wattle
	<i>Acacia dealbata</i>	Silver Wattle
	<i>Acacia rubida</i>	Red-leaved Wattle
	<i>Acacia terminalis</i>	Sunshine Wattle
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium
Goodeniaceae	<i>Goodenia hederacea</i>	Ivy Goodenia
Haloragaceae	<i>Gonocarpus tetragynus</i>	
Lamiaceae	* <i>Marrubium vulgare</i>	Horehound
Loranthaceae	<i>Amyema pendula</i>	Drooping Mistletoe
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Lomandra multiflora</i>	Many-flowered Mat-rush
Loranthaceae	<i>Amyema pendulum</i>	
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
	<i>Eucalyptus bridgesiana</i>	Apple Box
	<i>Eucalyptus macroryncha</i>	Red Sringybark
	<i>Eucalyptus polyanthemus</i>	Red Box
	<i>Eucalyptus rossii</i>	Inland Scribbly Gum
	<i>Kunzea ericoides</i>	Burgan
Oxalidaceae	<i>Oxalis perennans.</i>	Grassland Wood Sorrel
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn
Plantaginaceae	* <i>Plantago lanceolata</i>	Lamb's Tongues
	<i>Plantago varia</i>	
Poaceae	* <i>Aira</i> sp.	
	<i>Aristida</i> sp.	
	<i>Austrodanthonia carphoides</i>	Short Wallaby Grass
	<i>Austrostipa scabra</i>	Corkscrew
	<i>Austrostipa densiflora</i>	Brushtail Speargrass
	<i>Bothriochloa macra</i>	Redgrass
	<i>Elymus scaber</i>	Wheatgrass
	* <i>Hordeum</i> sp.	
	* <i>Holcus lanatus</i>	Yorkshire Fog

Family Name	Scientific name	Common Name
	<i>Microlaena stipoides</i>	Weeping Rice Grass
	<i>Panicum simile</i>	Two-colour Panic
	<i>Panicum effusum</i>	Hairy Panic
	<i>Poa sieberiana</i>	
Polygonaceae	* <i>Acetosella vulgaris</i>	Sheep Sorrel
Primulaceae	* <i>Anagallis arvensis</i>	Scarlet/Blue Pimpernel
Rosaceae	<i>Acaena ovina</i>	
	* <i>Rosa rubiginosa</i>	Sweet Briar
	* <i>Rubus fruticosus</i>	Blackberry
Scrophulariaceae	* <i>Orobancha minor</i>	
	* <i>Verbascum thapsus</i>	Blanket Weed
Sinopteridaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern
Solanaceae	* <i>Solanum linnaeanum</i>	Apple of Sodom

APPENDIX 2

Assessments of Impact according to Part 3A Guidelines for Threatened Species Assessment

Eastern Bentwing-bat***Miniopterus schreibersii oceanensis***

The Eastern Bentwing-bat is listed as Vulnerable under Schedule 2 of the TSC Act.

The Eastern Bentwing-bat was detected during the field survey within the study area on an ultrasonic recording device (i.e. Anabat). The call was not confidently identified however the species has been previously recorded in proximity to the study area (Johnstone Centre 2004) and in accordance with the Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004), despite the ambiguity in the identification this species is assumed to be found on site.

An additional four records occur within 10km of the study area to the north, south-east and south-west. Three of these records occur within the locality.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Eastern Bentwing-bat utilises caves for roosting and breeding. The Eastern Bentwing-bat uses a broad range of habitats including rainforests, wet and dry sclerophyll forests, open woodlands and open grasslands for foraging (Churchill 2008). The species breeds in caves, but can also use man-made structures such as mines and road culverts for roosting (Churchill 2008; Dwyer 1995). Specific caves are used as nursery sites, containing a large number of individuals, which can be used year after year (Churchill 2008; Dwyer 1995).

The study area provides known and/or potential foraging habitat in the form of eucalypt and riparian forests and woodlands. No breeding or preferred roosting habitat (i.e. caves) occurs in the study area.

The proposal is likely to directly remove and/or modify approximately 3ha of potential foraging habitat for this species with the remaining 8.9ha of the study area likely to be indirectly impacted temporarily. These indirect impacts include the potential for increased run off of sedimentation and weed dispersal down-slope. However, this increased erosion and weed dispersal potential will be managed to limit the effects on adjacent vegetation through the use of bunding and other sediment control procedures implemented during construction. It is unlikely that the proposal would remove or disturb caves within the study area; as such breeding habitat is unlikely to be impacted. Given the mobility of this species and extent of available foraging habitat within the locality, it is unlikely the lifecycle of the Eastern Bentwing-bat would be affected by the proposal.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

Potential foraging grounds for Eastern Bentwing-bat may be impacted by vegetation clearing. However foraging grounds for this highly mobile species are not considered limiting given that they forage over a broad range of habitat types.

Approximately 3ha of potential habitat would be directly impacted with a further 8.9ha likely to be indirectly impacted through the increased potential for increased runoff and weed dispersal. Potential habitats are widely distributed within the locality; as such it is unlikely the proposal would have a major impact on potential habitat.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Eastern Bentwing-bat populations are found along the east and north-west coasts of Australia (DEC 2005e). The study area is not at, or near, the limit of distribution for the Eastern Bentwing-bat.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits.

The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station.

These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation.

The Eastern Bentwing-bat is highly mobile; therefore it is unlikely that this bat species would be impacted by the reduced connectivity within the locality.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Eastern Bentwing-bat (DECC 2008).

Conclusion

Based on the above assessment the proposal is considered unlikely to have a major impact on the Eastern Bentwing-bat.

Rosenberg's Goanna***Varanus rosenbergi***

The Rosenberg's Goanna is listed as Vulnerable under Schedule 2 of the TSC Act.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

A critical habitat component for Rosenberg's Goanna are termite mounds which this species requires for nesting (DEC 2005k). The eggs are laid within the termite mound which maintains constant temperatures to incubate the clutch of eggs buried within the mound. Juveniles dig themselves out of the mound upon hatching and like many other reptiles, are independent from birth.

The proposal will involve the removal and/or disturbance of up to 3ha of habitat containing termite mounds which are a critical habitat component for this species' reproductive cycle.

The woodland habitat supports a moderate density of termite mounds which have established over wooded debris accumulated throughout the site beneath the eucalypt trees. All termite mounds throughout the study area are small mounds, generally measuring less than 35cm in height.

Where possible the proposed access track will avoid disturbance to existing termite mounds, however a number of termite mounds occur within the subject site.

Given the study area supports a moderate density of termite mounds, the loss of up to five (mostly shallow) termite mounds within the subject site is expected to be a minor impact to the lifecycle of this species.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

This species is a sandstone specialist found throughout a variety of habitats including open forests, heaths and woodlands. Like many predators, Rosenberg's Goanna occupies large home ranges over which it forages; feeding on carrion, birds, eggs, other reptiles and small mammals (DEC 2005k).

Rosenberg's Goanna may shelter within hollow logs, rock crevices and in burrows which they may dig themselves or occupy existing burrows including rabbit warrens (DEC 2005k).

The proposal will involve the removal and/or disturbance of up to 3ha of foraging and breeding habitat for this species. Given this species occupies large home ranges and is highly mobile, the area of habitat to be removed is considered to be a relatively small amount and would result in minor impacts to the Rosenberg's Goanna.

Does the proposal affect any threatened species that are at the limit of its known distribution?

Rosenberg's Goanna occurs in isolated populations within NSW, VIC, SA and WA. Within NSW Rosenberg's Goannas are found within two disjunct populations. The northern population occurs on Sydney Sandstone from Wollemi National Park to the north-west of

Sydney. The southern population occurs throughout the Goulburn and ACT regions and near Cooma in the south. The proposal is located roughly in the middle of the southern NSW population, approximately 100km from the limit of the northern and southern distribution for this population and is therefore not at the limit of distribution for this species.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits.

The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant adjoining the track is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section of the woodland which exists parallel to the current track.

The Rosenberg's Goanna moves over large home ranges and the widening and establishment of new track is not expected to hinder the movement of this species or disrupt habitat connectivity.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Rosenberg's Goanna (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Rosenberg's Goanna. **Speckled Warbler**
Pyrrholaemus saggitatus

The Speckled Warbler is listed as Vulnerable under Schedule 2 of the TSC Act (NSW Scientific Committee 2008a). A pair of Speckled Warblers was observed during the field

survey. This species has been recorded on four occasions within the locality and a further six times in within a 10km radius of the study area.

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The proposal will involve the removal of up to 3ha of potential habitat for the Speckled Warbler. The Speckled Warbler nests in low dense shrubby vegetation. Nests are built from dry grass and tree bark, nestled in a slight hollow on the ground or at the base of a low dense plant, typically among fallen branches, leaf litter and organic debris (DEC 2005n). The habitat throughout the study area has patches of low suitably dense vegetation which the Speckled Warbler may breed in however for the most part the habitat is quite open and sparse.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Speckled Warbler is found throughout a range of open canopy Eucalypt woodlands which possess a grassy native understorey, with sparse shrubs often on ridges or in gullies. They feed on seeds and insects gleaned from the understorey and ground beneath bushes and trees. They require relatively large undisturbed remnants of habitat. Pairs occupy home ranges of about 10 ha which may be larger in the non-breeding season (DEC 2005n).

The proposal will involve the removal and/or disturbance of up to 3ha of woodland habitat. Generally the Speckled Warbler has experienced a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The further fragmentation of habitats is a threat to this species which tend to occupy large home ranges (approximately 10ha) of relatively intact vegetation.

Given the vegetation to be removed is primarily along the existing track adjacent to the cleared land within the Water Treatment Plant facility, the proposal will only be establishing short distances of new road through sparse woodland avoiding densely wooded areas where possible.

Although the proposal will result in some fragmentation of woodland adjacent to the existing tracks and Water Treatment Plant, the works are considered to be a minor impact on the habitat available for the Speckled Warbler.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The Speckled Warbler distribution extends from south-eastern Queensland in the north to Victoria in the south (DEC 2005n). The study area does not occur at or near the limit distribution for the Speckled Warbler.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed

infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section (approximately 200m) of the woodland which exists parallel to the current track.

The Speckled Warbler forages along the ground in clearings and open areas, although this species requires large relatively intact areas of habitat to persist. The widening of the existing track and establishment of approximately 200m of new track is expected to be a minor impact on habitat connectivity for the Speckled Warbler.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Speckled Warbler (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Speckled Warbler.

Brown Treecreeper***Climacteris picumnus victorae***

The Brown Treecreeper (eastern subspecies) is listed as Vulnerable under Schedule 2 of the TSC Act.

The species is found in Eucalypt woodlands (mainly dominated by stringybarks or other rough-barked Eucalypts) and dry open forest, usually with an open grassy understorey, although sometimes with one or more shrub species (DEC 2005a).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Brown Treecreeper is known to nest in hollows, usually in dead branches or spouts, but also in trunks of living or dead trees. The species breeds in pairs or co-operatively in territories, which range in size between approximately one and 11ha (generally around 4ha) (DEC 2005a).

Brown Treecreepers have been recorded in woodland adjacent to the study area. The study area itself is likely to provide breeding habitat for this species in the form of hollow-bearing trees.

The proposal will involve the removal of up to a maximum of 3ha of woodland habitats. The habitat to be removed primarily exists along an existing access track with narrow strips of roadside vegetation to be removed. The vegetation is generally sparse however some hollow-bearing Eucalypts may be removed as a result of the proposal. Where possible these trees will be avoided.

Consequently the proposal is likely to have a minor impact on the lifecycle of the Brown Treecreeper in the area through the removal of potential breeding resources.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The Brown Treecreeper lives in Eucalypt woodlands and dry open forests, usually dominated by stringy barks or other rough-barked Eucalypts, especially in areas of relatively flat open woodland, and which lack a dense shrub layer, contain short grass or bare ground and have fallen logs or dead trees present (DEC 2005a; Traill and Duncan 2000). The species forages within trees and on the ground.

The Brown Treecreeper is almost entirely insectivorous, but would occasionally take nectar. It forages for ants, beetles and larvae in trees and on the ground. In trees, the species mostly forages among crevices and holes on trunks and larger limbs, preferring rough-barked eucalypts. On the ground the species forages on fallen logs and under bark, at the base of grass tussocks and amongst leaf litter and other debris (DEC 2005a).

The study area provides potential habitat for the Brown Treecreeper in the form of woodland vegetation and hollow-bearing trees.

The proposal would involve some clearing of vegetation and trees, which includes some hollow-bearing trees. As such, the proposal is likely to have a minor impact on the habitat of the Brown Treecreeper in the area.

Does the proposal affect any threatened species that are at the limit of its known distribution?

The eastern subspecies of Brown Treecreeper (*Climacteris picumnus victoriae*) occurs from the western slopes to the coastal watersheds of the Great Dividing Range, south of the Bunya Mountains in south-eastern Queensland through NSW and Victoria and west to the Grampians (Higgins et al. 2001). The study area does not occur at or near the limit of distribution of the Brown Treecreeper.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation. A small section of access track will be established which deviates from the existing track. This section will fragment a small section (approximately 200m) of the woodland which exists parallel to the current track.

The Brown Treecreeper forages in wooded areas, although this species requires large relatively intact areas of habitat to persist, the widening of the existing track and establishment of approximately 200m of new track is expected to be a minor impact on habitat connectivity for the Brown Treecreeper.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Brown Treecreeper (DECC 2008).

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Brown Treecreeper.

Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>
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The Eastern False Pipistrelle is listed as Vulnerable under Schedule 2 of the TSC Act.

The species inhabits sclerophyll forests, preferring wet habitats where trees are more than 20m high (Churchill 1998). The Eastern False Pipistrelle hunts beetles, moths, weevils and other flying insects above or just below the tree canopy (Churchill 1998). There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary and enter torpor (Menkhorst and Lumsden 1995).

This species also appears to be highly mobile and records indicate movements of up to 12km between roosting and foraging sites (Menkhorst and Lumsden 1995). This species roosts in hollow-bearing trees (both dead and alive) and caves and buildings (Churchill 1998). Two observations have been made of roosts in stem holes of living Eucalypts (Phillips 1995).

How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Eastern False Pipistrelle was recorded within the study area (in the gully of Googong Creek) during previous surveys (Johnstone Centre 2004). This species is known to roost in hollow-bearing trees (both dead and alive) and/or caves and buildings (Churchill 1998). No caves occur within the study area. Many hollow-bearing trees were recorded within the study area, however, all were in dry habitats not usually favoured by this species.

Clearing for the proposal would remove some hollow-bearing trees that could potentially provide roosting habitat for this species. This is unlikely to have an adverse effect on the life cycle of this species as hollows occur throughout the woodland in adjacent areas where the forests is more to this species' preference. The removal of existing vegetation in the study area is not likely to affect the life cycle of the Eastern False Pipistrelle.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The study area provides potential habitat for the Eastern False Pipistrelle in the form of sparse woodland vegetation and hollow-bearing trees.

Habitat throughout much of the area is considered suboptimal for the Eastern False Pipistrelle, however, foraging may occur on occasion. The proposal would lead to the removal of some foraging and roosting habitat in the area.

Does the proposal affect any threatened species that are at the limit of its known distribution?

In NSW, the Eastern False Pipistrelle has a distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. It also occurs in Tasmania (Churchill 1998). The study area does not occur at or near the limit of distribution of the Eastern False Pipistrelle.

How is the proposal likely to affect the current disturbance regimes?

The study area has been subject to disturbances associated with the adjacent Water Treatment Plant. Disturbance regimes currently observed on site include weed infestations, disturbance associated with the existing dirt track, and presence of feral rabbits. The proposal will involve the widening of the existing dirt track to create an all-weather access road. Some clearing of vegetation will occur where the Bulk Water Pumping Station will be developed and a new section of road will extend from the existing road to access the Bulk Water Pumping Station. These current disturbances (spread of weeds, road disturbances, clearing of vegetation) may be exacerbated as a result of the proposal.

How is the proposal likely to affect habitat connectivity?

The proposal involves the widening of the existing access track, clearing of vegetation for the Bulk Water Pumping Station and clearing of vegetation to create a new portion of all-weather access track to service the Bulk Water Pumping Station. The proposed works will increase the width of the track however the track for the most part travels along the boundary of the Water Treatment Plant fence line. As the habitat within the Water Treatment Plant itself is predominantly cleared, the widening of the track will not result in habitat fragmentation.

The Eastern False Pipistrelle is highly mobile; therefore it is unlikely that this bat species would be impacted by the reduced connectivity within the locality.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the Eastern False Pipistrelle (DECC 2008).

The proposal will have a minimal impact on known and/or potential habitat for this species. Also, given the suboptimal nature of the habitat and high mobility of this species, it is not likely to be critical to the survival of this species.

Conclusion

Based on the above assessment the proposed activities are unlikely to have a major impact on the Eastern False Pipistrelle.

APPENDIX 3

Assessments of Impacts according to EPBC Act Significant Impact Guidelines

Significant impact criteria for Endangered Ecological Communities (EECs)

An action (i.e. the proposal) is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community;
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- adversely affect habitat critical to the survival of an ecological community;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
 - assisting invasive species, that are harmful to the listed ecological community, to become established; or
 - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community;
- interfere with the recovery of an ecological community.

Assessment of current proposal

Is there a real chance or possibility the action will reduce the extent of an ecological community?

A small patch (i.e. approximately 1210m²) of Blakely's Red Gum / Red Box / Apple Box Grassy Woodland occurs within the study area (refer Figure 3). This vegetation community has been determined as meeting the floristic and structural criteria described for the EPBC Act-listed Critically Endangered Ecological Community known as White Box / Yellow Box / Blakely's Red Gum Grassy Woodland and Derived Native Grasslands. The proposal would result in the construction and ongoing maintenance of an all-weather access track which is to be located adjacent to the boundary of the EEC. The proposal would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbances are located outside of the EEC. As such, it is considered unlikely that the proposal would reduce the current extent of the patch of the EEC.

Is there a real chance or possibility the action will fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?

The EEC occurring within the study area exists as a small, isolated patch which is surrounded by a vegetation community characterised by a canopy which does not contain the Eucalypt species which are keystone to the EEC. Whilst not considered to substantially fragment the EEC, it is noted that an unformed dirt access track currently passes through the centre of the EEC. Although not built-up, this dirt access track does act to fragment the groundstorey and appears to have encouraged the establishment of weeds in the immediate surrounding area.

Should the proposed all-weather access track be established up slope of the EEC, the proposed disturbance would occur within a highly disturbed, predominantly cleared and weed-dominated area. In this manner, the proposal would not cause fragmentation between the EEC and any natural vegetation community.

Should the proposed all-weather access track be established down slope of the EEC, the proposed disturbance would occur within a largely intact Dry Forest vegetation community which is well connected to the EEC. In this manner, whilst not resulting in direct fragmentation within the EEC, the disturbance would result in the fragmentation of the EEC from the similar (and supporting) vegetation community which bounds the EEC on three sides.

In light of the above, the establishment of the all-weather access track up slope of the EEC would be preferable as it would not result in the fragmentation of the EEC from any similar vegetation communities.

Is there a real chance or possibility the action will adversely affect habitat critical to the survival of an ecological community?

No critical habitat for the community has been listed under the EPBC Act Register of Critical Habitat. In addition the proposal would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbance is located outside of the EEC. As such, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of the EEC.

Notwithstanding the above, it would be imperative that suitable works boundaries are established and that no disturbance occurs outside of these defined boundaries. Similarly, suitable erosion and sediment control measures would be necessary to ensure that sediment and rubble does not encroach upon the EEC. Provided such measures are implemented, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of the EEC.

Is there a real chance or possibility the action will modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?

The proposal would result in the construction and ongoing maintenance of an all-weather access track which is to be located adjacent to the boundary of the EEC. The proposal

would ensure that all earthworks (excavation, fill placement, etc), vegetation clearing and other disturbances are located outside of the EEC. The proposal is unlikely to result in a substantial alteration to groundwater levels or surface water drainage within the EEC, or that may impact upon the EEC. If the access track is to be located up slope of the EEC, appropriate drainage infrastructure would be installed in order to maintain the current overland flow patterns through the EEC. The proposal will not require the exportation or importation of materials that would substantially modify the nutrient levels and water retention capacity of the soils within the locality.

Is there a real chance or possibility the action will cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?

The works associated with the proposal would be limited to those required to construct and maintain an all-weather access track which would pass by the EEC. No significant impacts upon the current species composition and structure of vegetation communities are likely to occur outside of the defined disturbance corridor required for track construction (which would be located outside of the EEC). Refer response to the below criteria regarding the potential for infestation and proliferation of weed species within the EEC. No alteration to the current burning regime would occur as a result of the proposal and no flora or fauna harvesting would occur.

Is there a real chance or possibility the action will cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- assisting invasive species, that are harmful to the listed ecological community, to become established, or
- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?

The most destructive and significant threat to this EEC is the clearing of the EEC for any purpose. Second to land clearing is the encroachment, establishment and proliferation of invasive plant species (weeds) which degrade the quality and integrity of the EEC. In severe cases, weed encroachment can result in the degradation of the groundstorey of the EEC, such that the patch no longer meets the floristic and structural criteria for consideration as the EEC.

The patch of this EEC occurring within the study area currently supports significant infestations of exotic weeds. In fact, the low-lying areas associated with the small drainage line which traverses the EEC are dominated by annual and perennial herbaceous weed species. In addition, the land between the EEC and the boundary of the Googong Dam Water Treatment Plant is dominated by exotic weeds with only sparsely scattered occurrences of disturbance tolerant native forbs and grasses. It is likely that the current weed infestations within the EEC have established from seed and propagules which have originated within the Googong Dam Water Treatment Plant, upslope of the EEC.

The proposed construction of an all-weather access track that would pass by adjacent to the patch of EEC is unlikely to result in a substantial increase in the proliferation of the current weed infestations with the EEC and surrounding areas. Conversely, establishment of the access track upslope of the EEC would provide an opportunity to remove and manage the dense weed infestation (and considerable source of weed propagules, etc) currently occurring between the EEC and the Googong Dam Water Treatment Plant.

In addition to the above, as part of the proposal it will be imperative to implement suitable measures to avoid the further introduction and transportation of weeds into the EEC. Such measures would include: the development of a weed distribution map across the study area; conducting a pre-construction weed control program; and, implementing strict vehicle hygiene controls such as cleaning of tyres, wheel guards and bases of machinery before entry into the area.

The proposal would not result in the use of fertilisers, herbicides or other chemicals or pollutants into the EEC in a manner that would impact upon the EEC. The use of herbicides within the vicinity of the EEC would be limited to that required for target specific weed treatment.

Provided suitable management measures are implemented prior to, during and post construction works, it is considered unlikely that the proposal would result in a substantial reduction in the quality or integrity of the EEC.

Is there a real chance or possibility the action will interfere with the recovery of an ecological community?

It is recognised that all occurrences of this critically endangered ecological community are of great importance to the national preservation of the EEC. Notwithstanding this, the significance of this patch to the wider recovery of the EEC is limited due to its very small size (i.e. 1210m²), isolated nature and existing considerable infestations of exotic weeds.

Given that the proposal would locate all disturbance outside of the EEC, incorporate suitable weed reduction and management measures and appropriately manage hydrological impacts (i.e. erosion, changes to flow patterns, etc), it is considered unlikely that the proposal would adversely interfere with the patch of EEC or the wider recovery of the EEC.

APPENDIX 4

Flora and Fauna Potential Habitat Tables

Potential Threatened Fauna Habitat

Table 7 – Potential Habitat for Threatened Fauna within the Study Area

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
Amphibians				
<i>Litoria aurea</i> Green and Golden Bell Frog	V	E1	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999a; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005f).	No
<i>Litoria castanea</i> Yellow-spotted Tree Frog	E	E1	The Yellow-spotted Tree Frog has only recently (2010) been recorded in the wild again. Before this it had not been recorded in the wild since the 1970s (DEC 2005r). It has a disjunct distribution, being recorded on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation. It shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation (Robinson 1998; DEC 2005r).	No
<i>Litoria raniformis</i> Southern Bell Frog	V	E1	In NSW the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks (Robinson 1993; DEC 2005m).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
Birds				
<i>Circus assimilis</i> Spotted Harrier	-	V	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast (NSW Scientific Committee 2010a). Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation (NSW Scientific Committee 2010a). The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees (Marchant and Higgins 1993).	No
<i>Haliaeetus leucogaster</i> White-bellied Sea-eagle	M	-	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive (Marchant and Higgins 1993). Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees (Marchant and Higgins 1993).	Yes
<i>Hieraaetus morphnoides</i> Little Eagle	-	V	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species (NSW Scientific Committee 2009b). It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests (Marchant and Higgins 1993).	No
<i>Apus pacificus</i> Fork-tailed Swift	M	-	Almost exclusively aerial. The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April (Higgins 1999). Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 metres high (Boehm 1944).	No
<i>Hirundapus caudacutus</i> White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia (Pizzey and Knight 1997).	Yes

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Ardea alba</i> Great Egret	M	-	Terrestrial wetlands, estuarine and littoral habitats and moist grasslands. Inland, prefer permanent waterbodies on floodplains; shallows of deep permanent lakes (either open or vegetated), semi-permanent swamps with tall emergent vegetation and herb dominated seasonal swamps with abundant aquatic flora. Also regularly use saline habitats including mangrove forests, estuarine mudflats, saltmarshes, bare saltpans, shallows of salt lakes, salt fields and offshore reefs. Breeding requires wetlands with fringing trees in which to build nests including mangrove forest, freshwater lakes or swamps and rivers (Marchant and Higgins 1990).	No
<i>Ardea ibis</i>	M	-	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands (Marchant and Higgins 1990).	No
Cattle Egret				
<i>Collocephalon fimbriatum</i>	--	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	Yes
Gang-gang Cockatoo				
<i>Climacteris picumnus victorinae</i>	-	V	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	Yes , recent local records
Brown Treecreeper (eastern subspecies)				
<i>Myiagra cyanoleuca</i>	M	-	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey and Knight 1997).	Yes
Satin Flycatcher				

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Rhipidura rufifrons</i> Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey and Knight 1997).	No
<i>Anthochaera phrygia</i> Regent Honeyeater	E	C1	<p>A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS 1999b; Pizzey and Knight 1997).</p> <p>Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>E. microcarpa</i>, <i>E. punctata</i>, <i>E. polyanthemus</i>, <i>E. mollucana</i>, <i>Corymbia robusta</i>, <i>E. crebra</i>, <i>E. caleyi</i>, <i>C. maculata</i>, <i>E. mckieana</i>, <i>E. macrorhyncha</i>, <i>E. laevopineae</i> and <i>Angophora floribunda</i>. Nectar and fruit from the mistletoes <i>A. miquelii</i>, <i>A. pendula</i>, <i>A. cambagei</i> are also eaten during the breeding season (DEC 2005j).</p> <p>Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female (DEC 2005j).</p>	Yes, marginal potential habitat

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Epthianura albifrons</i> White-fronted Chat	-	V	<p>The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state (Higgins <i>et al.</i> 2001).</p> <p>The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands. Along the coastline, they are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the species is often observed in open grassy plains, saltlakes and saltpans that are along the margins of rivers and waterways (Higgins <i>et al.</i> 2001).</p> <p>In Victoria White-fronted Chats have been observed breeding from late July through to early March. Nests are built in low vegetation and in the Sydney region nests have also been observed in low isolated mangroves (NSW Scientific Committee 2009d).</p> <p>An Endangered Population occurs in the Sydney Metropolitan CMA area, at Newington Nature Reserve near Homebush and at Towra Point Nature Reserve (NSW Scientific Committee 2009e).</p>	No
<i>Merops ornatus</i> Rainbow Bee-eater	M	-	<p>Usually occurs in open or lightly timbered areas, often near water. Nest in embankments, including banks of creeks and rivers, in sand dunes, in quarries and in roadside cuttings. Breeding occurs from November to January. It has complex migratory movements in Australia. NSW populations migrate north for winter (Higgins 1999).</p>	Yes
<i>Daphoenositta chrysoptera</i> Varied Sittella	-	V	<p>The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts (Higgins and Peter 2002; NSW Scientific Committee 2010b). The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (NSW Scientific Committee 2010b).</p>	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Chthonicola sagittata</i> Speckled Warbler	-	V	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers <i>et al.</i> 1984; NSW Scientific Committee 2008a). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers <i>et al.</i> 1984; NSW Scientific Committee 2008a). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2008a).	Yes , observed on site during the current survey
<i>Stagonopleura guttata</i> Diamond Firetail	-	V	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs (Pizzey and Knight 1997). Often occur in vegetation along watercourses (Higgins <i>et al.</i> 2006).	Yes
<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern form)	-	V	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas (Traill and Duncan 2000).	Yes
<i>Petroica boodang</i> Scarlet Robin	-	V	During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet (NSW Scientific Committee 2009c). The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (NSW Scientific Committee 2009c). It is conspicuous in open and suburban habitats (Morcombe 2006).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Petroica phoenicea</i> Flame Robin	-	V	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border (Australian Museum 2009). The species is also found in Tasmania. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, whilst in winter prefers open woodlands and farmlands (NSW Scientific Committee 2009a). It is considered migratory. The Flame Robin breeds from about August to January (Morcombe 2006).	No
<i>Lathamus discolor</i> Swift Parrot	E	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> (DEC 2005p). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey and Knight 1997).	Yes, marginal potential foraging habitat
<i>Polytelis swainsonii</i> Superb Parrot	V	V	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall Eucalypt trees within 9 km of feeding areas (Higgins 1999).	No
<i>Rostratula australis</i> Australian Painted Snipe	VM	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant and Higgins 1993).	No
<i>Gallinago hardwickii</i> Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
Invertebrates				
<i>Synemon plana</i> Golden Sun Moth	Z	E1	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses of the genus <i>Austrodanthonia</i> (DECC 2005a). It is believed that the females lay up to 200 eggs at the base of the <i>Austrodanthonia</i> tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of <i>Austrodanthonia</i> (DEWHA 2008).	No
Mammals				
<i>Dasyurus maculatus maculatus</i> Spotted-tailed Quoll (south- eastern mainland)	E	V	Occurs along the east coast of Australia and the Great Dividing Range (Belcher <i>et al.</i> 2008). Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999k). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995). 70% of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage (NPWS 1999c). The home range of a female is between 180 – 1000 ha, while males have larger home ranges of between 2000 – 5000 ha. Breeding occurs from May to August (Belcher <i>et al.</i> 2008).	Yes, some foraging habitat available
<i>Phascolarctos cinereus</i> Koala	N	V	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region (DEC 2005g). Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally (Martin <i>et al.</i> 2008). Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> (DoP 1995). They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha (Martin <i>et al.</i> 2008).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Falstrellus tasmaniensis</i> Eastern False Pipistrelle	-	V	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes (Churchill 2008). Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails (Law <i>et al.</i> 2008). Has a large foraging range, up to 136 ha (Churchill 2008; Law <i>et al.</i> 2008). Records show movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	Yes
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	-	V	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways (Churchill 2008; Hoyer and Hall 2008).	Yes, possible call recorded on anabat during current and previous surveys
<i>Myotis macropus</i> Large-footed Myotis	-	V	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects (Richards <i>et al.</i> 2008)).	No
Reptiles				
<i>Tympanocryptis pinguicollis</i> Grassland Earless Dragon	E	E1	Occurs at sites dominated by wallaby grasses (<i>Austrodanthonia</i> spp.), spear grasses (<i>Austrostipa</i> spp.), Poa Tussock (<i>Poa sieberiana</i>), Red Grass (<i>Bothriochloa macra</i>), and occasionally Kangaroo Grass (<i>Themeda australis</i>). Introduced pasture grasses occur at many of the sites supporting this species. It apparently prefers areas with a more open structure, characterised by small patches of bare ground between the grasses and herbs. Partially embedded surface rocks, and spider and insect holes are used for shelter. Rocks and arthropod holes provide important thermal refuges during temperature extremes (DECC 2005b).	No

Scientific Name/ Common name	EPBC ¹ Act	TSC ² Act	Habitat	Potential Habitat?
<i>Aprasia parapulchella</i> Pink-tailed Legless Lizard	V	V	Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005h). Key habitat features are a cover of native grasses, particularly Kangaroo Grass (<i>Themeda australis</i>), sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface (Osborne and Jones 1995).	No
<i>Delma impar</i> Striped Legless Lizard	V	V	Generally occurs in lowland native grasslands occurring on gently undulating plains having soils of basaltic origin (Coulson 1990). Grasses are dominated by perennial, tussock-forming grasses such as <i>Themeda triandra</i> , <i>Austrostipa</i> spp. and <i>Austrodanthonia</i> spp. Inhabits secondary grasslands only when they occur within 2km of primary grassland (Hadden 1995).	No
<i>Varanus rosenbergi</i> Rosenberg's Goanna	-	V	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992). Termite mounds are a critical habitat component (DEC 2005k).	Yes

Potential Threatened Flora Habitat

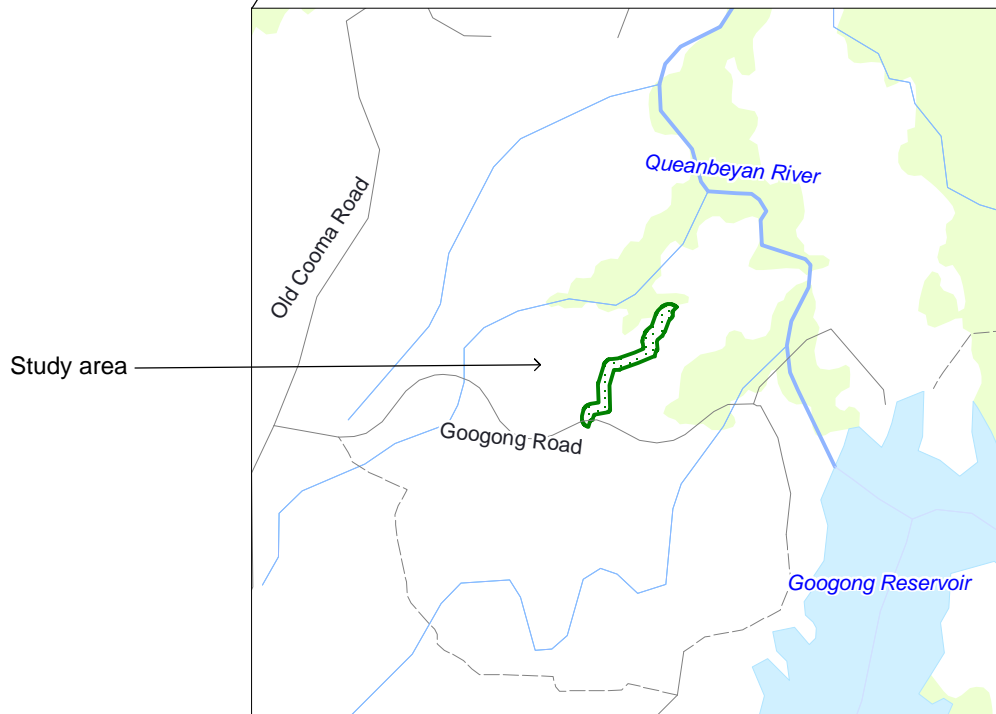
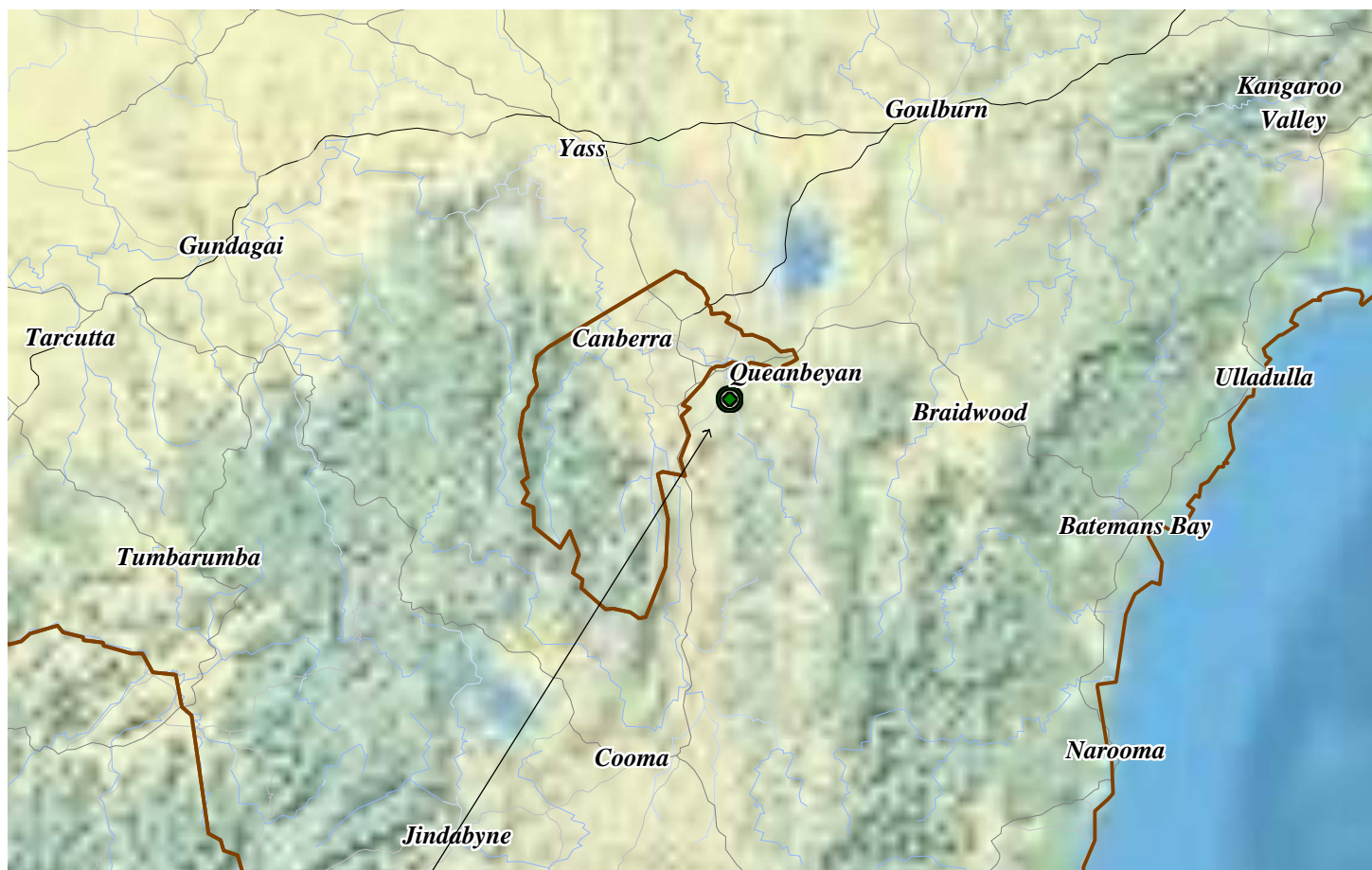
Table 8 – Potential Habitat for Threatened Flora within the Study Area

Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Calotis glandulosa</i> Mauve Burr-daisy	V	V	Occurs at higher altitudes between Eden and Dubbo where it grows in grassland and sclerophyll forest (Harden 1992). The main distribution is in the Monaro and Kosciuszko regions. There is a known site in the upper Shoalhaven catchment and record from near Oberon. There are old, highly dubious records from the Dubbo area and Mt Imlay. Found in montane grasslands in the Australian Alps and subalpine grassland (dominated by <i>Poa</i> spp.), Natural Temperate Grassland (dominated by <i>Themeda australis</i>) and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands on the Monaro and Shoalhaven area. Appears to be a coloniser of bare patches, which explains why it is often seen on roadsides. Apparently common on roadsides in parts of the Monaro. Does not persist in heavily-grazed pastures of the Monaro. Dispersed by the sticky burrs (DEC 2005d)	No
<i>Leucochrysum albicans</i> var. <i>tricolor</i> Hoary Sunray	E	-	In the ACT Hoary Sunray can be seen in spring in abundance on the roadside along Fairbairn Avenue and into Mt Ainslie Nature Reserve, on the western slopes of Mt Majura and adjacent to the Federal Highway road easement (ACT Government, 2004). In NSW it is distributed on the inland slopes and plains including grassland on the Monaro. The species occurs from Queensland to Victoria and in Tasmania. The species is usually found in ungrazed and lightly grazed areas, along roadsides in particular. It appears to be very sensitive to grazing, but responds to disturbance as a coloniser and appears to tolerate mowing (ACT Government, 2004). Flowers spring to summer (Harden 1992).	Yes
<i>Rutidosia leptorrhynchoidea</i> Button Wrinklewort	E	E1	Occurs in the ACT and Monaro region where it grows in grassland and woodland. This species flowers mostly in summer (Harden 1992). Occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland or in Natural Temperate Grassland; and often in the ecotone between the two communities. Grows on soils that are usually shallow, stony red-brown clay loams; tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). Exhibits an ability to colonise disturbed areas (e.g. vehicle tracks, bulldozer scrapings and areas of soil erosion) (DEC 2005b).	Yes

Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Swainsona recta</i> Small Purple Pea	E	E1	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum <i>Eucalyptus blakelyi</i> , Yellow Box <i>E. melliodora</i> , Candlebark Gum <i>E. rubida</i> and Long-leaf Box <i>E. goniocalyx</i> . It grows in association with understorey dominants that include Kangaroo Grass <i>Themeda australis</i> , poa tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp. Plants die back in summer, surviving as a rootstocks until they shoot again in autumn. Generally tolerant of fire, which also enhances germination by breaking the seed coat and reduces competition from other species (DEC 2005).	Yes, marginal habitat. Not recorded during surveys.
<i>Swainsona sericea</i> Silky Swainson-pea	-	V	Grassland and eucalypt grassy woodland, sometimes with Callitris species (Harden 2002; NSW Scientific Committee 2008b). 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 <i>Eucalyptus pauciflora</i> Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes (DEC 2005c).	Yes, marginal habitat. Not recorded during surveys.
<i>Caladenia tessellata</i> Tessellated Spider Orchid	V	E1	<i>Caladenia tessellata</i> is found in the following Catchment Management Regions Sydney Metropolitan, Southern Rivers, Hawkesbury/Nepean, and Hunter/Central Rivers. Currently known from three disjunct areas: Braidwood on southern tablelands, Ulladulla on the south coast and three populations in Wyong area on the Central Coast (DEC 2005c). It is generally found in grassy, dry sclerophyll forests/woodland, particularly those associated with clay loam, or sandy soils. However, there is one population at Braidwood in lowland on stony soil (DEC 2005c). This species only grows in very dense shrubbery in coastal areas (Bishop 1996). Flowers appear between September and November, but generally late September or early October in extant southern populations (DEC 2005c).	No
<i>Pomaderris pallida</i> Pale Pomoderris	V	V	Pale Pomaderris has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum (<i>Eucalyptus mannifera</i>) and Red Stringybark (<i>E. macrorhynca</i>) or Callitris spp. Woodland (DEC 2005).	Yes, marginal habitat. Not recorded during surveys.

Scientific Name/ Common name	EPBC Act ¹	TSC Act ²	Habitat	Potential Habitat?
<i>Thesium australe</i> Austral Toad-flax	V	V	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. <i>Thesium australe</i> is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass (DEC 2005q). It is often found in damp sites in association with <i>Themeda australis</i> , but also found on other grass species at inland sites (G. Leonard pers. obs.). Occurs on clay soils in grassy woodlands or coastal headlands (James <i>et al.</i> 1999).	No

FIGURES



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

Date: 4 February 2011

Drawn by: ANP

File number: 12826

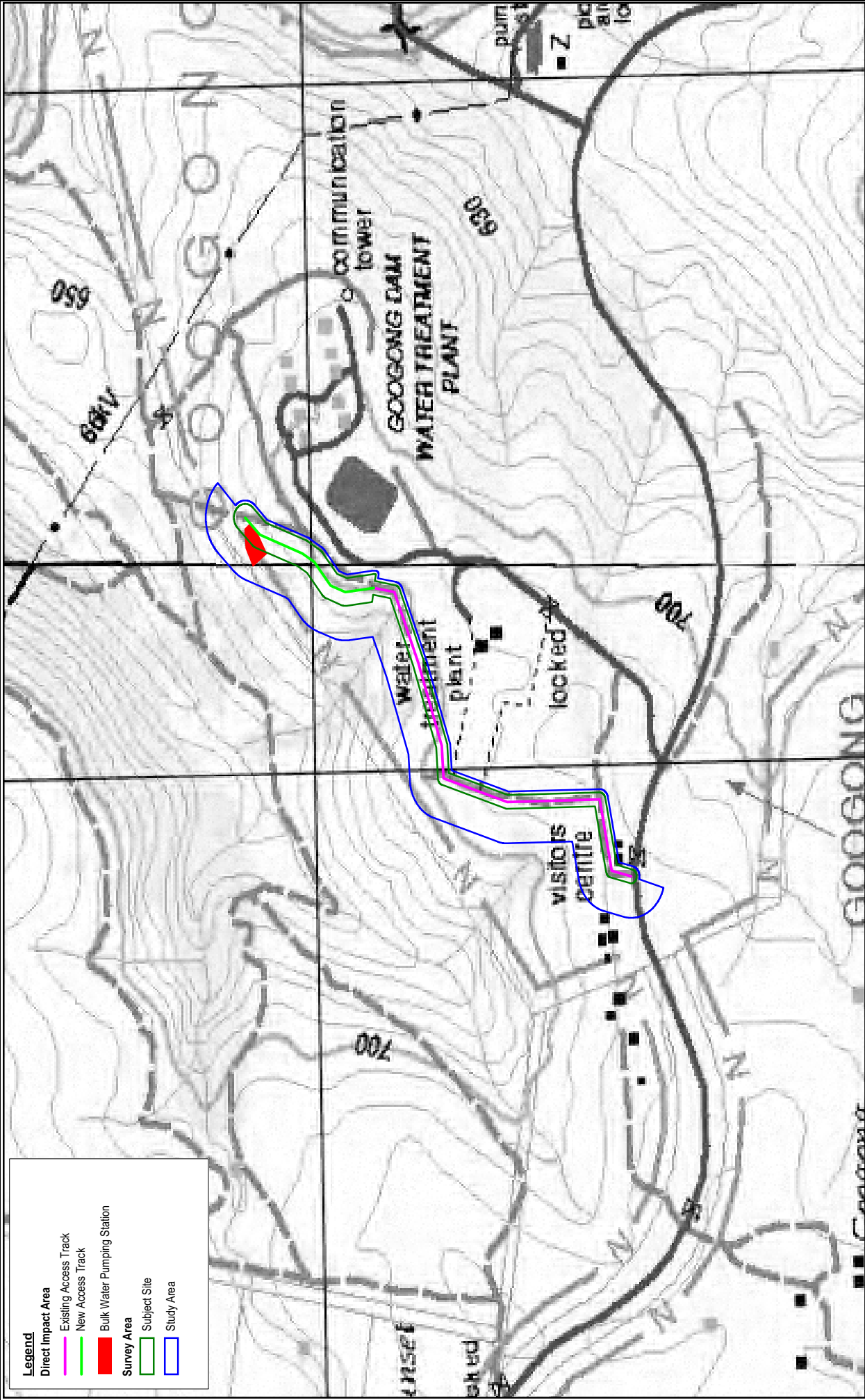
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Scale:







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Figure 2: Overview of the Study Area and Subject Site.

Date: 7 March 2011	Drawn by: JMS
File number: 12826	Checked by: JKD
Location: P:\12800s\12826 Mapping\12826 F2_Overview WOR	

Legend

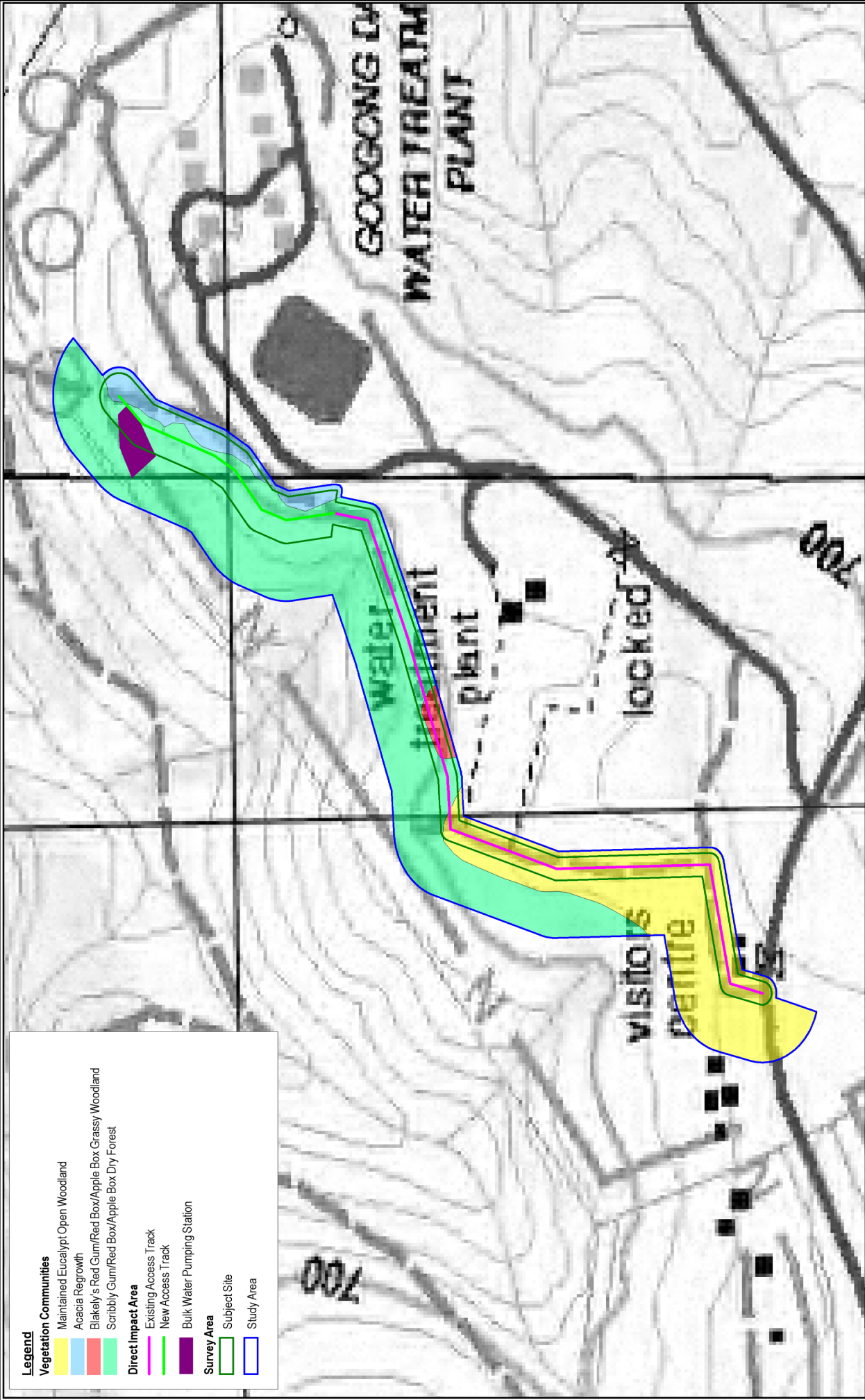
- Direct Impact Area
- Existing Access Track
- New Access Track
- Bulk Water Pumping Station
- Survey Area
- Subject Site
- Study Area

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Scale: 1:5,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

0 50 100 150 200 250
metres

Figure 2



Legend

Vegetation Communities

- Maintained Eucalypt Open Woodland
- Acacia Regrowth
- Blackely's Red Gum/Red Box/Apple Box Grassy Woodland
- Scribbly Gum/Red Box/Apple Box Dry Forest

Direct Impact Area

- Existing Access Track
- New Access Track
- Bulk Water Pumping Station

Survey Area

- Subject Site
- Study Area

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Figure 3: Vegetation Communities

Date: 15 February 2011

File number: 12826

Location: - P:\12800s\12826\F3_Vegetation Communities WOR

Drawn by: ANP

Checked by: JKD

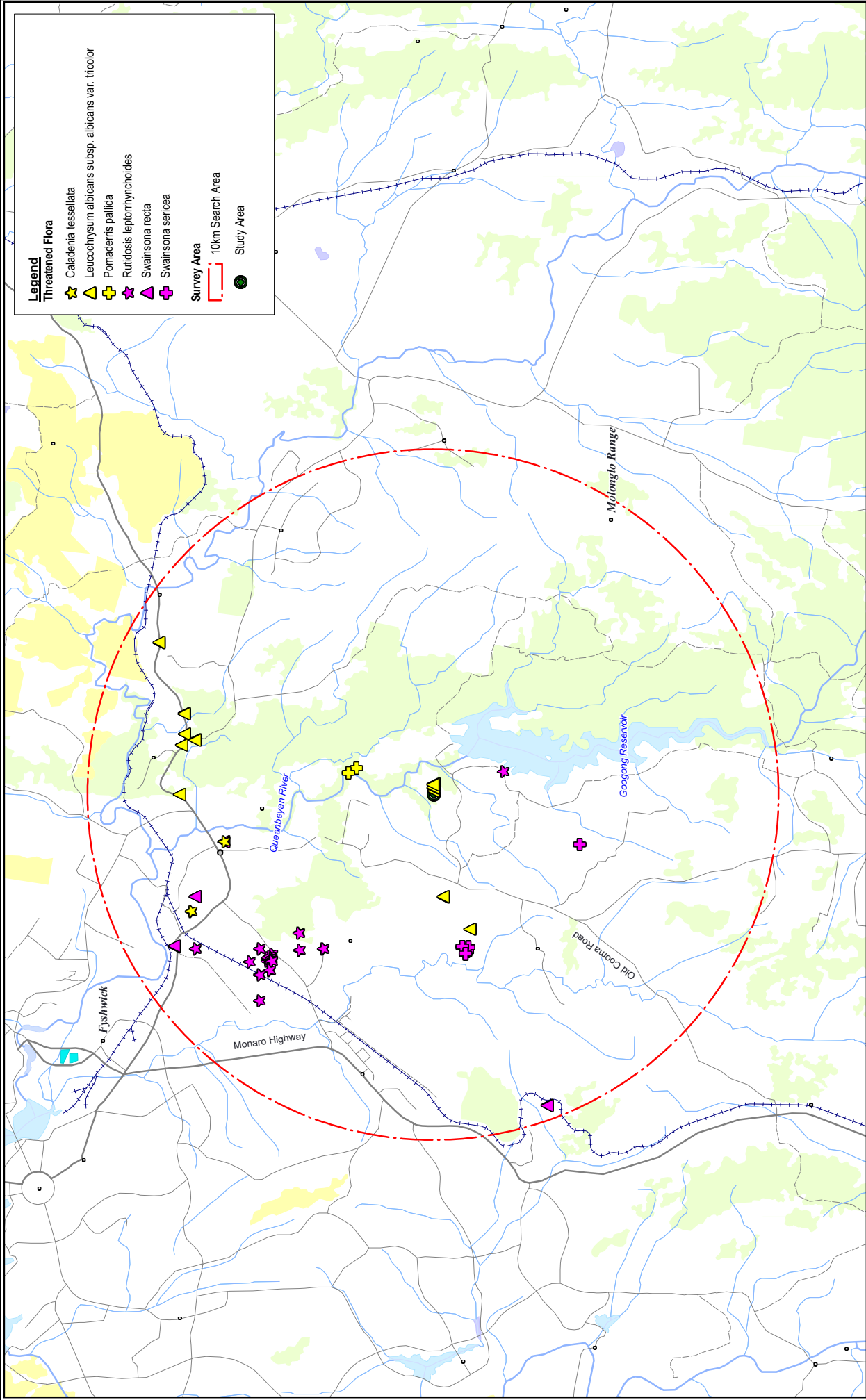
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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1984
Grid Map Grid of Australia, Zone 56

Figure 3





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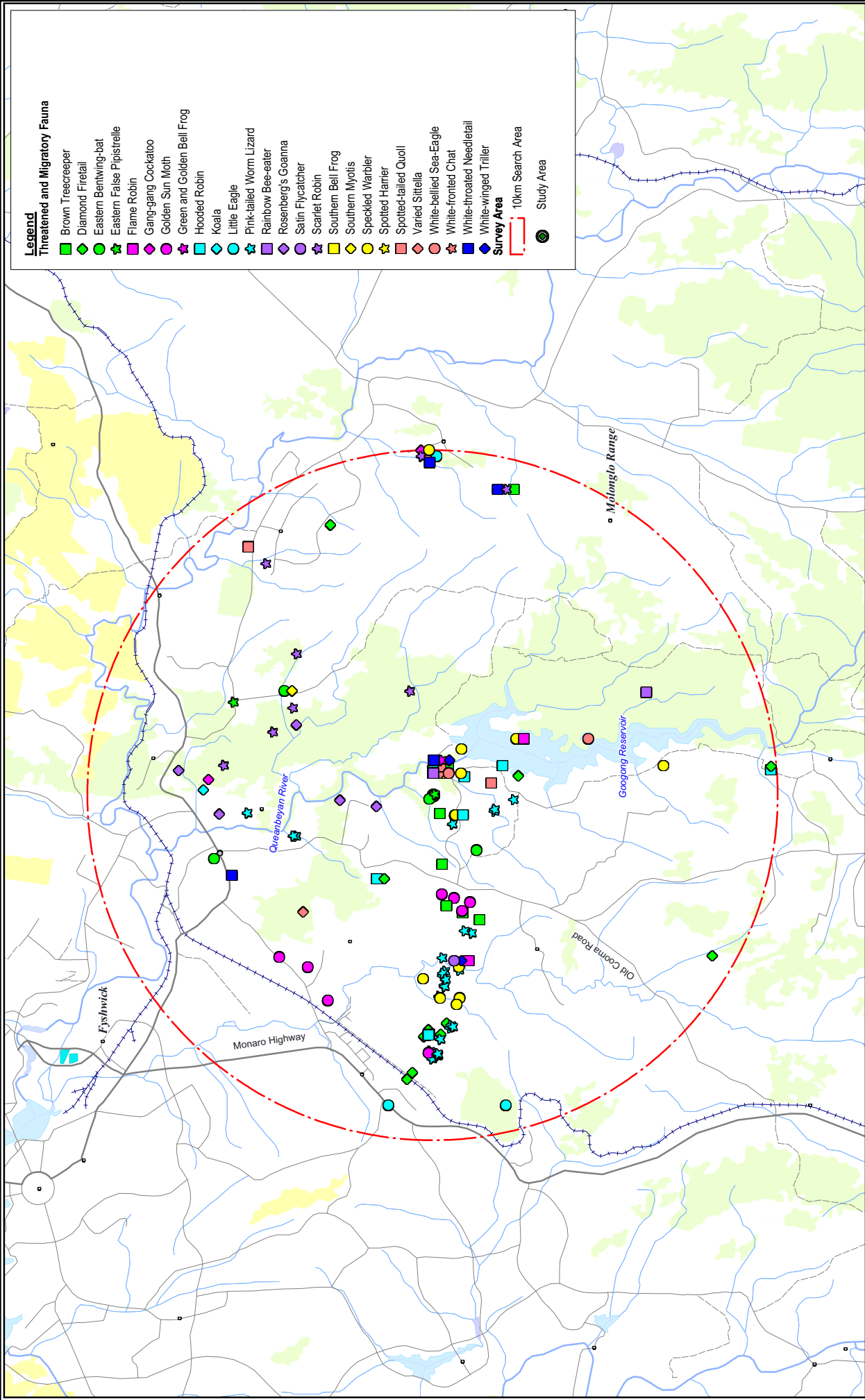
Figure 4: Threatened flora species occurring within a 10km radius of the Study Area.


Date: 4 February 2011	Drawn by: ANP
File number: 12826	Checked by: JKD
Location: P:\128006\12826\Maping\12826_F4_Flora.WOR	

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

Figure 4



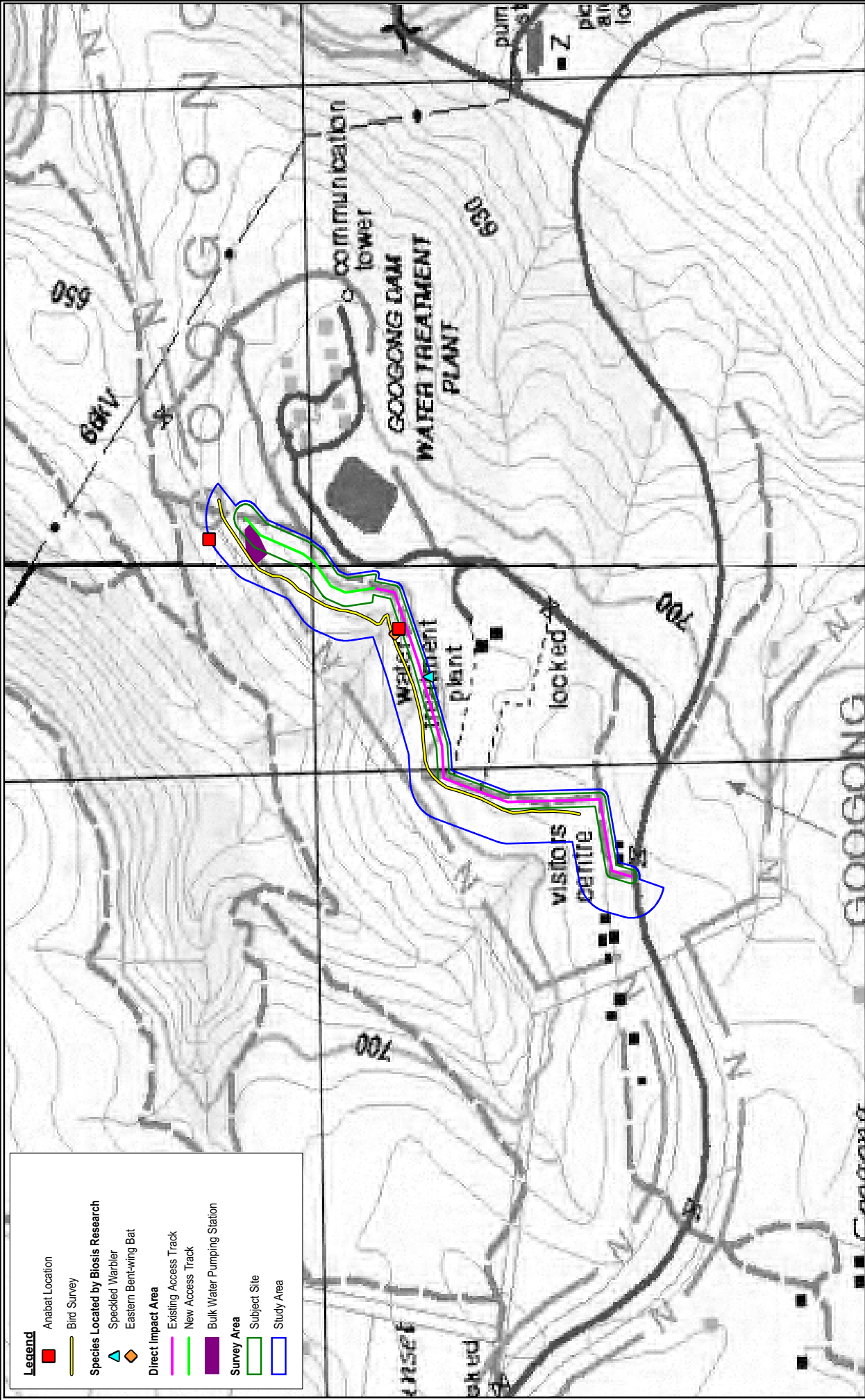



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Figure 5: Threatened fauna species occurring within a 10km radius of the Study Area.

Date: 4 February 2011	Drawn by: ANP
File number: 12826	Checked by: JKD
Location: P:\128006\12826\Mapping\12826_F5_Fauna.WOR	

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Figure 6: Survey effort map and threatened species recorded on site.

Date: 15 February 2011	Drawn by: ANP
File number: 12826	Checked by: JKD
Location: P:\12800s\12826\Mapping\12826 F6_Survey Effort.WOR	

Acknowledgements:
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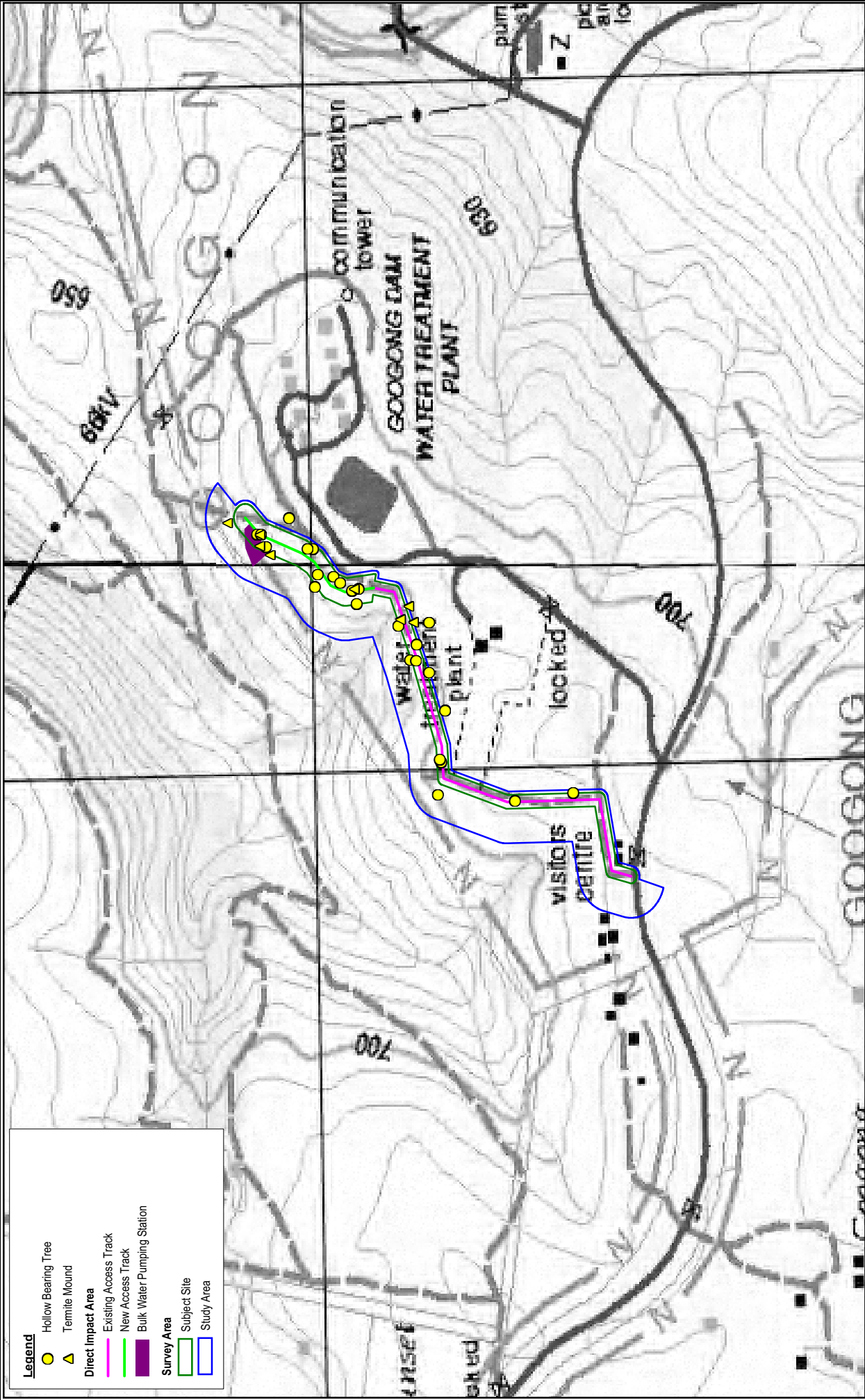


Figure 6



Scale: 1:5,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56





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Figure 7: Hollow bearing trees and termite mounds occurring within the Study Area.

Date: 20 April 2011

File number: 12826

Location: P:\12826\12826 Mapping\12826 F7\HBT_200411.WOR

Drawn by: ANPJMS

Checked by: JKD

Acknowledgements:
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Scale: 1:5,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

0 50 100 150 200 250
metres

Figure 7

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Appendix B **Technical memorandum
– water recycling plant
process and OEH
licence limits**

TO: Craig Harris - CIC Australia

DATE: 19 January 2011

CC:

REF: A1081404

FROM: MWH

MWH Australia Pty Ltd

SUBJECT: Googong Township – Water Cycle Project – Environmental Assessment Responses

This memorandum has been prepared as a response to the comments of the Department of Environment, Climate Change and Water (DECCW) dated 21st December, 2010. The comments of DECCW have been reviewed by MWH and areas applicable to the concept design are noted in this document.

The proposed effluent quality for environmental discharge has been highlighted by DECCW. The parameters which have been altered by DECCW from the original concept design are outlined in Table 1. All DECCW proposed discharge conditions are achievable where plant operating staff are sufficiently experienced in maintaining efficient plant operation.

Table 1: Parameters which vary between concept design and DECCW recommendations

Parameter	DECCW proposed discharge (90 th percentile)	Proponents proposed limit (90 th percentile)
Suspended Solids	10 mg/L	20 mg/L
Total Nitrogen (TN)	10 mg/L	15 mg/L
Total Phosphorous (TP)	0.5 mg/L	0.5 mg/L
Total Dissolved Solids (TDS)	700 mg/L	700 mg/L
Faecal Coliforms	200 cfu/100mL	No proposed limit
pH	6.5 – 8.5	No proposed limit
Free Chlorine Residual	0.1 mg/L	No proposed limit
Nitrogen – Ammonia	2 mg/L	No proposed limit
Oil and Grease	2 mg/L	No proposed limit

Suspended Solids

The suspended solids concentration of 10mg/L (90th percentile) is expected to be achieved by the current MBR design.

Total Nitrogen

Reducing the 90th percentile limit for TN is achievable but will potentially increase operating costs.

The MBR design comprised of a 5-stage Bardenpho reactor design, followed by membrane separation. The limit of 10mg/L in the 90th percentile may be achieved using the 5-stage Membrane Bioreactor (MBR) technology, currently proposed. 5-stage Bardenpho technology allows for full nitrification and denitrification, allowing a very low effluent TN concentration.

Mass balance modelling was completed in during the concept design stages and a plant capability statement was issued to CIC Australia dated the 29th Sept, 2009. Modelling showed that the expected average TN concentration was 5.9 mg/L. Hence, it is expected that the WRP will be able to achieve the TN limits of 7mg/L and 10mg/L in the 50th and 90th percentiles, respectively.

Experienced operational staff are essential to achieving the minimum possible output TN concentration. Previous experience has shown that operating a Bardenpho plant achieving the design effluent condition will be difficult without a good fundamental knowledge of the processes involved. This may have an impact on operational costs in the form of additional training or operator supervision.

In order to improve the TN performance (to 10mg/L 90th %ile), additional “carbon dosing” may be required. This additional carbon will enter the system as acetic acid dosing. This may result in a significant increase in the overall operating costs in the form of increased chemical costs.

Total Dissolved Solids

The TDS limit which has been proposed will only be achievable where biological phosphorous removal is utilised. Furthermore, the mass balance which predicts TDS concentration is based on a assumed inlet water salt concentration from domestic waste. If the level of salt is above the assumed input, the TDS requirement may not be achieved.

Faecal Coliforms

The recycled water specification was set as a faecal coliform concentration of 1 cfu/100mL. The current plant design specifies that all flows shall pass through disinfection. Hence, the faecal coliform limit of 200 cfu/100mL will be comfortably achieved.

Free Chlorine Residual

Small changes to the design configuration of the plant discharge arrangement and/or network will be required to meet the DECCW proposed 90th percentile free chlorine limit of 0.1 mg/L. We have identified two ways of meeting the licence requirement

In the current design, disinfection in the transfer pipeline has been designed to ensure a free chlorine residual of 1mg/L at the downstream end of the pipeline. This ensures that the appropriate “CT” value of Concentration x Time of treatment is achieved, as described in the MWH concept design report. The free chlorine concentration leaving the “Chlorine Contact Tank” (ie the pipeline), in the modelled scenario, will be approximately 1 mg/L. This is well in excess of the DECCW proposed 90th percentile limit of 0.1 mg/L.

The environmental water release strategy must be reviewed in order to achieve the DECCW recommendation of 0.1mg/L. Two options may be considered, de-chlorination using sodium bisulphite (SBS) or removal of the chlorination step for water which is to be sent to the environment.

1. De-chlorination

SBS may be used to bind free chlorine in the systems to a state where it is chemically inert. This SBS step is normally used for treatment plants that use chlorine for disinfection, then discharge to a river or stream. Introducing SBS will involve the design and construction of a chemical dosing facility at each of the environmental discharge locations. The current design shows a discharge point into

stormwater pond 1 for the early years of operation, and then a second release point at the top of Pond 4 once the full recycled water system is constructed.

Utilising SBS will allow for the currently proposed discharge locations to be maintained, without the need for additional transfer pipelines.

The dosing rate for de-chlorination is expected to be in the order of 5 kg of SBS solution per mega litre of water discharged to the environment. A schematic of the proposed SBS dosing scheme is given in Figure 1.

The ownership and operation of dosing outside of the plant may cause difficulties. For example, the specific location of the sample point must be considered in detail. The licence sample point must be located at Basin 4, in order for de-chlorination to be conducted at the Basin 4 discharge point. Utilising an off-site sample point may present significant operational difficulties in plant operation due to any changes in water quality, including any of the licence parameters, within the transfer pipeline. This issue must be considered further in choosing a de-chlorination option.

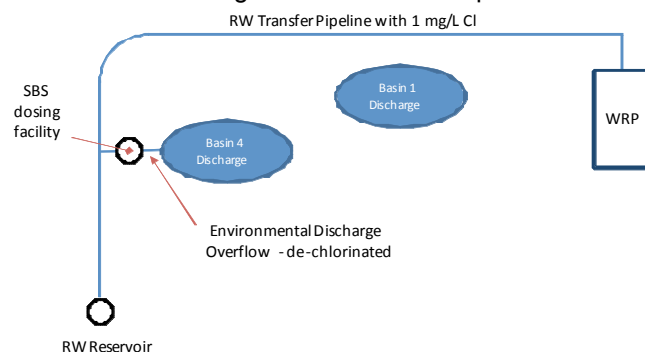


Figure 1: Schematic of environmental discharge to Basin 4, utilising SBS dosing for de-chlorination.

2. Removal of Chlorine dosing for environmental discharge

The WRP has been configured with two stages of disinfection (UV then chlorine) to meet the strict requirements of the risk-based recycled water guidelines. However, releases to the environment do not require such a high standard of disinfection. Hence it may be preferable to split the treatment at the final stage to two streams, one for the recycled water system and the other for environmental releases.

The chlorination stage may be removed from the treatment process for flows which are discharged to the environment only. All flows which are to be used for recycling will require chlorination. This approach will require the physical separation of flows for water re-use and flows for environmental discharge.

Flows from the WRP which are above the requirement for RW use, will bypass chlorination at the WRP, as instructed by the plant flow control system. The flow which bypasses chlorination will be transferred to an environmental discharge point at Basin 1, via a dedicated pipeline. This option will require the provision of a second transfer pipeline, adding to the overall plant capital costs. The second pipeline will be required at all stages where RW is produced, as a dedicated conduit will be required for all non-chlorinated water. A schematic of the proposed pipeline configuration is given in Figure 2.

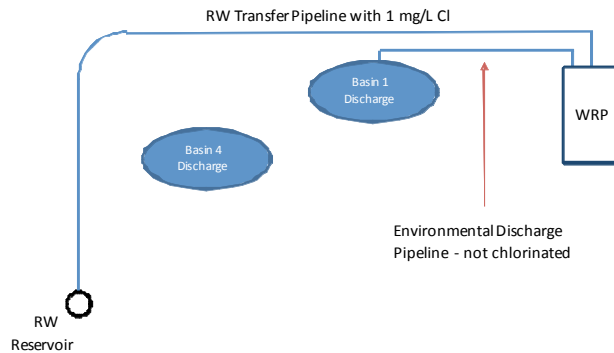


Figure 2: Schematic of environmental discharge strategy to Basin 1, where the discharged volume is not chlorinated

The DECCW recommended environmental discharge limit for faecal coliforms is 200 cfu/100mL. This may be achieved by a combination of secondary treatment, membrane filtration (in the MBR) and UV disinfection. Hence, chlorination is not essential for the environmental discharge of plant effluent, in order to meet the recommended discharge quality.

Algae production may cause significant issues where plant effluent is discharged without chlorination. It is not expected that UV treatment alone will prevent the growth of algae in the receiving water course. Algal growth may be most problematic during periods of dry weather, creating a significant impact on the Basin 1 discharge location and downstream waterways.

Nitrogen – Ammonia

The 5- stage Bardenpho reactor which has been design is expected to achieve full nitrification. This ensures that all ammonia may be converted to nitrate. Hence, the effluent condition of 2mg/L (90th percentile) may be achieved by the current design.

Oil and Grease

The current design is expected to achieve 2 mg/L of oil and grease. This reduction will be achieved by the membrane filtration process.

Completed by:
Angus Wilkie

Reviewed by:
Susan Kitching

Graduate Process Engineer
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Senior Process Engineer
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Appendix C **Pink-tailed Worm Lizard**
(*Aprasia parapulchella*)
impact assessment
report



Googong Township

Pink-tailed Worm-lizard (*Aprasia parapulchella*) Impact Assessment Report

A report prepared for CIC Australia Limited

January 2011

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DOCUMENT CONTROL SHEET

PROJECT	Googong Township Pink-tailed Worm-lizard Impact Assessment Report
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BIOSIS PROJECT NO	12364
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REPORT FOR	CIC Australia Limited
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REPORT TITLE:	Googong Township Pink-tailed Worm-lizard (<i>Aprasia parapulchella</i>) Impact Assessment Report
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AUTHOR(S):	Robert Speirs
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REVISION	PREPARED	INTERNAL REVIEW	EXTERNAL REVIEW	AMENDED
Draft	Robert Speirs	Jennifer Charlton	Dr Will Osborne	25-01-2011
Final	Robert Speirs	Jennifer Charlton		

ABBREVIATIONS AND COMMON TERMS

DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (formerly Department of the Environment, Water, Heritage and the Arts)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
Googong Township	The area encompassed by the Googong Township
LEP	Local Environmental Plan
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Study Area	The area of the Googong Township assessed as <i>Aprasia parapulchella</i> habitat
PTWL	Pink-tailed Worm-lizard
PTWL Conservation Area	The area of the Study Area proposed to be dedicated and managed as a conservation area for Pink-tailed Worm-lizard.
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 EXECUTIVE SUMMARY

Biosis Research Pty Ltd has been engaged by CIC Australia Limited (CIC) through the project management firm Manidis Roberts Pty Ltd to prepare an assessment of the impacts of the Googong Township upon an area of known Pink-tailed Worm-lizard (*Aprasia parapulchella*) habitat occurring within the proposed Googong Township. *A. parapulchella* is listed as 'vulnerable' pursuant to the Commonwealth EPBC Act and the NSW TSC Act.

The Study Area is located in the eastern section of the future Googong Township, directly adjoining Googong Foreshores along the township's eastern boundary. Habitat assessments carried out during broader ecological surveys completed by Biosis Research (2009) throughout the Googong Township identified the *A. parapulchella* potential habitat associated with the lower reaches of Montgomery Creek (i.e. the Study Area).

Targeted field surveys (including turning appropriate shelter rocks) were undertaken to ground-truth information obtained during a desktop review and previous field studies and to gather additional data from the Study Area. The combined information from field and desktop studies was then used to assess the quality and value of the ground-truthed *A. parapulchella* habitat throughout the Study Area.

Approximately 6200 suitably sized shelter rocks were over-turned and 13 live *A. parapulchella* individuals and three sloughs (shed skins) were recorded. Following the field surveys, the quality and value of the *A. parapulchella* habitat throughout the Study Area was mapped according to ranking criteria that incorporated the abundance and density of surface rocks as well as vegetation cover type. Thus, the Study Area has been segmented into areas of 'Very High', 'High', 'Medium' and 'Low' quality habitat for *A. parapulchella* using the ranking criteria.

Results of the field surveys and habitat value mapping were used to inform the preparation of an 'Assessment of Significance' and to make recommendations for the design and ongoing management of a proposed Pink-tailed Worm-lizard Conservation Area. CIC proposes to establish, rehabilitate and dedicate to public ownership, a 52 ha PTWL Conservation Area that would include the entire area mapped as 'Very High' quality habitat, the majority of the 'High' quality habitat and 'Medium' quality habitat as well as restore and protect areas of 'non-habitat', strategically located to increase habitat connectivity and reduce 'edge-effects'.

In addition to the above, CIC proposes to work collaboratively with the eventual land owner/manager(s) to implement a number of management measures to protect and enhance in the long-term, the *A. parapulchella* habitat within the PTWL Conservation Area.

The Significant Impact Criteria Assessment concluded a significant impact on *A. parapulchella* to be unlikely.

2.0 INTRODUCTION

Googong Township is a new master-planned town for a population of some 16,000 people. The vision is for a new, vibrant and sustainable community with an economic town centre and strong sense of place. It is the most significant urban development project undertaken by CIC Australia Limited (CIC) to date.

Biosis Research Pty Ltd has been engaged by CIC through the project management firm Manidis Roberts Pty Ltd to prepare an assessment of the impacts of the Googong Township upon an area of known Pink-tailed Worm-lizard (*Aprasia parapulchella*) habitat occurring within the Googong Township.

Aprasia parapulchella is listed as 'vulnerable' pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the New South Wales *Threatened Species Conservation Act 1995* (TSC Act). As such, this report will act to inform (via the 'Referral of Matters of National Environmental Significance' process) the Commonwealth Department of Sustainability, Environment, Water, Population and Communities' (DSEWPC) assessment of the Googong Township against the provisions of the EPBC Act.

CIC and Manidis Roberts have consulted with SEWPAC and DECCW throughout the development of the Googong Township concept and design. Pre-referral meetings were held between CIC and Manidis Roberts and representatives of SEWPAC on the 23rd of November 2010 and 1st of December 2010. These pre-referral meetings were held to provide an opportunity for CIC and Manidis Roberts to present the proposed approach to *A. parapulchella* management within the Googong Township (as described herein), and to discuss this approach with the Commonwealth regulatory authority. The representatives of SEWPAC were supportive of the approach to *A. parapulchella* management proposed for incorporation into the development of the Googong Precinct.

With regard to the above, this report provides the following.

- A. In Section 3 Aims – A description of the aims and objectives of this study.
- B. In Section 4 Background about *A. parapulchella* and the Study Area – Background information relating to *A. parapulchella* (i.e. species morphology, habitat etc.), the Study Area, Googong Township and wider locality.
- C. In Section 5 Methodology – Details of the methodology used during the targeted surveys for *A. parapulchella* completed throughout the relevant section of the Googong Township (i.e. the Study Area).
- D. In Section 6 Results – Details of the results gained during the targeted surveys for *A. parapulchella* completed throughout the relevant section of the Googong Township (i.e. the Study Area).
- E. In Section 7 Recommendations for Detailed Design and Management – Detailed recommendations for design and management measures that should be implemented during detailed design and ongoing management of the Googong Township (specifically relating to the proposed Pink-tailed Worm-lizard Conservation Area (PTWL Conservation Area) and surrounds).

- F. In Section 8 Proposed Development – Details of the proposed management of *A. parapulchella* which will be incorporated into the development of the Googong Township.
- G. In Section 9 Impact Assessment – An impact assessment is provided in the form of an ‘Assessment of Significance’ as required pursuant to the EPBC Act.

3.0 AIMS

The general aim of this investigation is to assess the impact of the development of the Googong Township upon known *A. parapulchella* habitat which occurs within the eastern section of the Googong Township.

This general aim will be met through meeting the following specific objectives.

1. To accurately determine via field surveys using hand-held GPS equipment (accurate to +/- 3m), the actual on-ground location and extent of the *A. parapulchella* habitat within the Googong Township. This defined area is herein referred to as the Study Area.
2. To describe and map the vegetation cover throughout the Study Area. This mapping has then been used (in addition to published literature and other relevant completed consultant reports) to assess the habitat suitability of the land throughout the Study Area to *A. parapulchella* and thereby rate the quality and value of the habitat.
3. To conduct targeted surveys for *A. parapulchella* throughout the Study Area in order to record the presence or absence of the species across the Study Area. The data collected in this manner has been used to confirm the presence of *A. parapulchella* and to further inform the assessment of habitat quality and value.
4. To provide recommendations for the design and ongoing management of the proposed PTWL Conservation Area (the majority section of the Study Area proposed to be dedicated and managed as a conservation area for *A. parapulchella*) as part of the development of the Googong Township.
5. To assess the impacts upon *A. parapulchella* resulting from the proposed development of the Googong Township incorporating the dedication of the PTWL Conservation Area and appropriate ongoing management regime.

4.0 BACKGROUND

4.1 Description of Study Area and Surrounds

The Study Area is located in the eastern section of the future Googong Township, directly adjoining Googong Foreshores along the township's eastern boundary (refer Figure 1). The Study Area encompasses a section of Montgomery Creek and associated hillslopes and incorporates approximately 60 hectares of land located within the Queanbeyan River catchment, approximately 10 kilometres to the south of Queanbeyan, New South Wales. The land to the west, northwest and south of the Study Area is predominantly cleared of native woody vegetation and supports grazing land which has undergone varying degrees of pasture improvement.

4.1.1 Landform, topography and soils

The Study Area contains a moderately to deeply incised section of the Montgomery Creek valley and sections of the surrounding hillslopes. The surrounding elevated lands to the west, north and south generally comprise gently undulating hills. Altitude ranges from 640 metres AHD at the point at which Montgomery Creek enters the Googong Foreshores to 720 meters AHD on the elevated ridges located in the southeast and eastern sections of the Study Area.

The geology of the local area consists of Silurian volcanics including the Colinton volcanics and the Capanana Formation (Jenkins 2000). There are various tuffs with minor siltstone, shale, sandstone and limestone (Jenkins 2000). Soils within the Study Area are shallow, infertile, strongly acidic and moderately drained, with outcropping granite rock (Jenkins 2000).

4.1.2 Management history and current vegetation condition

The majority of the Googong Township was cleared of native tree cover by felling and firing carried out post European settlement of the area during the early to mid nineteenth century (Navin Officer 2003). The steepest sections of the Montgomery Creek hillslopes were not cleared, likely due to the skeletal nature of the soils and difficult topography. As is evidenced by the existence of granite tors, scattered surface rocks and the general unevenness of the landscape, it can be determined that the cleared land within and directly adjoining the Study Area has not been subject to cultivation or levelling. Excavation and soil movement within the vicinity of the Study Area appears to have been limited to that associated with the construction of dams across the branches of Montgomery Creek, upstream of the Study Area.

Notwithstanding the above, the Study Area and surrounding sections of the Googong Township have been subject to grazing (notably by sheep) at various intensities for an extended period, likely extending back to the onset of pastoralism post European settlement. The grassland/pasture throughout the more open and flat land located to the west, northwest and south of the Study Area has undergone substantial pasture improvement and modification. This improvement and modification has occurred in support of, and as a result of, the grazing of the land. The resulting grassland/pasture in the pasture improved areas, whilst supporting a native grass component (i.e. primarily *Austrostipa* spp. and *Austrodanthonia* spp.), is dominated by exotic pasture grasses and weeds. The

entirety of the area encompassed by the Googong Township was described by the Johnstone Centre (2004) as 'non-native grassland and agricultural'.

The groundstorey vegetation throughout the Study Area supports a much higher proportion and diversity of native grasses and forbs. Whilst much of the Study Area supports a component of exotic pasture grasses and weeds, native grasses and forbs represent a much larger component of the groundstorey biomass. Kangaroo Grass (*Themeda triandra*) and other native species more sensitive to intense grazing and elevated soil fertility, constitute a significant component of the groundstorey biomass throughout much of the Study Area. No evidence is present to suggest that the land within the Study Area has been subject to a lower intensity grazing regime (i.e. sheep grazing appears to have occurred throughout the entire eastern section of the Googong Township). It can therefore be envisaged that the persistence of native grasses (notably Kangaroo Grass) and forbs has occurred primarily through the exclusion of pasture improvement management practises carried out to elevate soil fertility (i.e. spreading of fertiliser (especially superphosphate), incorporation of clover and other exotic pasture species etc).

A number of dense stands of Burgan (*Kunzea ericoides*) occur within the Study Area. Burgan is a large dense spreading Tea-tree (*Leptospermum*) like native shrub growing to approximately four metres in height. Generally considered a pioneer species, it vigorously occupies areas devoid of groundstorey vegetation and often inhibits growth of native grasses and forbs.

With regard to the above, it can be determined that whilst the vegetation and landform within the Study Area have been impacted upon by a long history of grazing, the land and associated vegetation type and condition within the Study Area has not been degraded to the extent of that located throughout the surrounding areas of the Googong Township. The management of the Study Area for pastoral purposes has resulted in the introduction of exotic grasses, herbaceous and woody weeds and has reduced the dominance of native groundstorey vegetation. It would reasonably be expected that the condition of the groundstorey vegetation throughout the Study Area would continue to degrade if the past and current management regime is maintained.

4.2 Description, Habitat and Ecology of *Aprasia parapulchella*

Pink-tailed Worm-lizard (*Aprasia parapulchella*) is a small fossorial reptile from the family Pygopodidae (legless lizards), which has a maximum snout vent length of 14 cm and a total length of about 24 cm. *A. parapulchella* is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species (Osborne and Coghlan 2004). *A. parapulchella* is moderately common within the ACT region and is often the most abundant reptile at locations within its defined habitat type (Osborne *et al.* 1991).

The species lives beneath surface rocks and occupies ant burrows where it feeds on ants, particularly their eggs and larvae (Osborne and Jones 1995). Key habitat features for the presence of *A. parapulchella* are a cover of native grasses (particularly Kangaroo Grass), sparse or no tree cover, little or no leaf litter, and scattered small rocks with shallow embedment in the soil surface (Osborne and Jones 1995).

In the Canberra region, the species is found in areas containing acid volcanic rock types - Late Silurian acid volcanics - that are derived from decomposing rhyodacite, rhyolite or

dacite or other Silurian volcanic rocks (Osborne and Coghlan 2004). The distribution of the species is centred on the ACT and this appears to be related to less soil (and rock) disturbance evidenced by the presence of a native grass cover, particularly Kangaroo Grass, Red-leg Grass (*Bothriochloa macra*) and Wattle Mat-rush (*Lomandra filiformis*) (Osborne and Jones 1995). The likelihood of occurrence of *A. parapulchella* increases with increasing cover of Kangaroo Grass which is a key botanical indicator of suitable habitat in the ACT region, along with Red-leg Grass and Wattle Mat-rush (Jones 1992, 1999; Osborne & Coghlan 2004). Alternatively, dominance of Speargrasses (*Austrostipa falcata*, *A. bigeniculata*) and Tussock Grass (*Poa labillardieri*) decreases the likelihood of finding the species (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005). Habitat sites in NSW, while not dominated by Kangaroo Grass, can still be described as native grassland (R. Rehwinkel pers. comm.).

Aprasia parapulchella habitat sites in the Queanbeyan region support native grassland, derived grassland and open and dry woodland habitats, usually with many loose and partially embedded rocks. Ground cover is typically dominated by Kangaroo Grass and Wallaby Grass (R. Rehwinkel pers. comm.). Open woodland habitats are dominated by Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*E. blakelyi*), while dry forest areas are dominated by Broad-leaved Peppermint (*E. dives*) and Candlebark (*E. rubida*) (Brown 2010).

However, moderate numbers of disturbed sites dominated by exotic ground cover species, such as Wild oats (*Avena* spp.), Fescues (*Vulpia* spp.), Flat weeds (*Hypocheirus* spp.) and Bromes (*Bromus* spp.) have been found to support at least some individuals, although it was not known if these sites support viable populations (Osborne and Coghlan 2004).

4.2.1 Distribution of *Aprasia parapulchella*

Regional

Aprasia parapulchella occurs in south-eastern Australia, where it is widely but patchily distributed from Gunnedah in northern NSW through southern NSW and the ACT to Bendigo in central Victoria (Brown 2010). The species has been recorded from several widely separated locations between Gunnedah and Albury in NSW, from numerous localities in the ACT, while in Victoria the species has been recorded only from the Bendigo region (Brown 2010). Other locations within this geographic area include near Cooma, Yass, Albury, Cootamundra, Tarcutta and Queanbeyan (DEWHA 2008a; DECC 2009). Records cover a wide altitudinal range, from about 200 m altitude near Bendigo to over 800 m altitude in the ACT (Brown 2010).

Locality

Aprasia parapulchella is regarded as moderately common within the ACT and region where it has a wide and scattered distribution along the rocky hills and slopes of the Murrumbidgee, Molonglo and Queanbeyan River corridors (Brown 2010). *A. parapulchella* has been widely recorded throughout the Googong Foreshores and surrounding areas (Johnstone Centre 2004). Surveys completed by the Johnstone Centre (2004) throughout the wider locality (encompassing the Googong Township) recorded seventeen individuals at two locations: thirteen within the “Talpa” property located within the Queanbeyan River catchment approximately two kilometres to the north of the Study Area; and, four within the “McLean” property located within the Jerrabomberra Creek catchment approximately

three kilometres to the west of the Study Area. The entire “Talpa” property is currently zoned ‘7e. Environment Protection’ on the Queanbeyan Local Environmental Plan (Googong) 2009. The Study Area was not recognised as *A. parapulchella* habitat by the Johnstone Centre (2004) and no targeted surveys were completed within. It is relevant to note however that Reservoir Hill (located in the north-western section of the Googong Township) was considered to support an isolated area of potential habitat by the Johnstone Centre (2004) and surveys were completed with no *A. parapulchella* being recorded.

Habitat assessments carried out during broader ecological surveys completed by Biosis Research (2009) throughout the Googong Township identified the *A. parapulchella* potential habitat associated with the lower reaches of Montgomery Creek (i.e. the Study Area). This potential habitat (in addition to the previously recognised potential habitat on Reservoir Hill) was surveyed by Biosis Research with two live *A. parapulchella* and one slough (shed skin) being recorded within the Study Area (Biosis Research & Ecowise Environmental 2009). Owing to the results and observations of the current study and previous studies conducted by Biosis Research (2009) and the Johnstone Centre (2004), the *A. parapulchella* habitat associated with the lower reaches of Montgomery Creek is considered to constitute the only considerable area *A. parapulchella* habitat within the Googong Township.

4.2.2 Threats to *Aprasia parapulchella*

The main threats to *A. parapulchella* as described in the ‘National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)’ (Brown 2010) are:

- habitat loss and fragmentation;
- removal of rocks;
- heavy grazing and trampling;
- invasion of habitat by weeds;
- modification of habitat i.e. tree planting, invasion of woody shrubs in native grasslands;
- changed fire regimes, which lead to a change in vegetation structure;
- recreational activities; and
- predation by introduced predators.

4.2.3 Existing conservation of *Aprasia parapulchella*

As described in the ‘National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)’ (Brown 2010), a number of initiatives are already in place to conserve *A. parapulchella*, including the following:

- listing as threatened in the ACT, NSW, Victoria and nationally;
- development of a conservation strategy for some ACT populations (TMS 2007) and an ACT Recovery Plan, published in 1995 (Osborne & Jones 1995);
- identification of priority management actions for NSW and Victorian populations;

- protection of several key populations in conservation reserves in the ACT (Canberra Nature Park, lower Molonglo River Corridor, Murrumbidgee River Corridor), NSW (Nail Can Hill Flora and Fauna Reserve, Fairlane Flora and Fauna Reserve, Googong Foreshore Reserve) and Victoria (Greater Bendigo National Park, Mt Sugarloaf Nature Conservation Reserve);
- the population at One Tree Hill was further protected by the donation of land from Trust for Nature and the acquisition of adjacent undeveloped private land on which the species occurs (P. Johnson pers. comm.);
- establishment of Wildlife Refuges on two private properties near Bredbo where *A. parapulchella* occurs, and fencing undertaken to limit stock access to these areas;
- recent surveys and monitoring of Victorian and southern NSW populations; and
- current research on the distribution and conservation status of *A. parapulchella* populations in the ACT and an assessment of the impact of pastoralism on the taxon (D. Wong pers. comm.).

5.0 METHODOLOGY

5.1 Approach

The study involved three key tasks: a desktop review; targeted field surveys; and habitat assessment and mapping. The desktop review involved gathering and reviewing existing information on *A. parapulchella* and its ecology. Field surveys were undertaken to ground-truth information obtained during the desktop review and to gather additional data from the Study Area. The combined information from field and desktop studies was then used to assess the quality and value of the ground-truthed *A. parapulchella* habitat throughout the Study Area.

5.2 Desktop Study

Existing information on *A. parapulchella* was obtained from a range of sources, including: databases searches; relevant departmental web pages; and, previous studies undertaken on the species particularly with relevance to the local area. A full list of documents cited is provided in the References section of this report.

Local records of *A. parapulchella* were obtained in October 2010 from the NSW DECCW's web-based Wildlife Atlas database.

A number of specialist technical reports and other resources relating to *A. parapulchella* within the region were examined, these included:

- *The reptile, amphibian and mammal fauna of the Stony Creek Nature Reserve, Australian Capital Territory*. Technical Report 6 (DEC 2004; Rauhala 1993);
- *Ribbons of Life Draft Aquatic Species and Riparian Zone Conservation Strategy*. Acton Plan No. 29 (ACT Government 2007);
- *Recovery Plan for the Pink-tailed Worm Lizard Aprasia parapulchella* (Osborne and Jones 1995; Osborne and Jones 1995);
- *Habitat Survey for the Endangered Pink-tailed Legless Lizard Aprasia parapulchella in the Lower Molonglo Valley, ACT* (Jones 1993);
- *DECCW Species profile Aprasia parapulchella*
<http://threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10061>;
and
- *DSEWPC Species Profile and Threats Database for Aprasia parapulchella*
http://www.environment.gov.au/cgibin/sprat/public/publicspecies.pl?taxon_id=1665.

5.3 Field Surveys

5.3.1 Delineation of extent of habitat

The location and extent of *A. parapulchella* habitat within the Googong Township was determined using hand-held GPS equipment (accurate to +/- 3m), to delineate the outermost boundary of potential habitat. Potential habitat was defined in accordance with the description of *A. parapulchella* habitat provided in Section 4.2 herein. With reference to the delineated location and extent of *A. parapulchella* habitat (i.e. the Study Area as illustrated on Figure 2), it is noted that in addition to this area, numerous small rocky outcrops occur to the west of the Study Area. These small rocky outcrops are isolated from the contiguous habitat within the Study Area, are surrounded by grazed improved exotic pasture and contain few small surface rocks. Nevertheless, surveys for *A. parapulchella* were conducted throughout these rocky outcrops without any *A. parapulchella* being recorded. In this regard, these small isolated rocky outcrops are not considered to support populations of, or habitat for, *A. parapulchella*.

5.3.2 Weather conditions

Targeted surveys for *A. parapulchella* were conducted over two days being the 2nd and 3rd of November 2010. Weather conditions during the fauna surveys were variable and consisted of short overcast periods with occasional scattered showers (<1mm) and extended periods of sunshine. The maximum temperatures recorded at Canberra on the 2nd and 3rd of November were 17.7 and 19 degrees Celsius respectively (Australian Bureau of Meteorology). These weather conditions were considered good to optimal for the survey method conducted.

5.3.3 Survey technique and effort

Targeted surveys for *A. parapulchella* involved approximately 16 person hours devoted specifically to turning suitable shelter rocks throughout the Study Area. *A. parapulchella* shelter under suitable rocks which they use to aid in thermoregulation (Osborne and Jones 1995). In this regard, suitable shelter rocks are considered to be those that are of a thickness that effectively aid in thermoregulation, considered to be 10 to 40cm in diameter and <20cm thick. These searches were carried out by two Biosis Research Ecologists moving across the Study Area in a zig-zag pattern. Surveys were carried out first on the northern side of Montgomery Creek, followed by the southern side. The number of rocks turned was tallied in half-hour increments and totalled approximately 6200 suitable shelter rocks. All rocks were immediately and carefully returned to their pre-disturbed position. Live individuals were measured (length), photographed and placed back at the base of the subject rock. All *A. parapulchella* individuals replaced in this manner promptly returned underneath the rock. Sloughs were also recorded and photographed and a GPS waypoint was marked at each recording location.

5.3.4 Vegetation and habitat quality mapping

The vegetation cover throughout the Study Area was recorded post completion of the targeted searches and concurrently with the delineation of the extent of the *A. parapulchella* habitat (referred to as habitat as apposed to potential habitat, post confirmation of *A. parapulchella* population during targeted surveys). The floristic

composition, structure and condition of the vegetation cover are important limiting factors for *A. parapulchella* potential habitat. These factors were recorded throughout the Study Area and used to make determinations relating to the quality of the *A. parapulchella* habitat.

5.3.5 Limitations

The completed targeted surveys for *A. parapulchella* were not influenced by any significant limitations. The surveys were intensive, incorporated the entire Study Area and were conducted during suitable weather and at the optimal time of year. Furthermore, the wet 2010 winter and spring have resulted in plentiful growth of both native and exotic plant species, providing optimal conditions to assess the vegetation cover throughout the Study Area.

6.0 RESULTS

6.1 Targeted Surveys for *Aprasia parapulchella*

The targeted surveys for *A. parapulchella* conducted throughout the Study Area on the 2nd and 3rd of November 2010 resulted in the turning of approximately 6200 suitably sized shelter rocks and the recording of 13 live individuals and three sloughs. Figure 2 illustrates the locations in which the *A. parapulchella* were recorded. The locations of the *A. parapulchella* recorded during the surveys completed by Biosis Research in 2009 (two live individuals and one slough) have also been presented on Figure 2.

All *A. parapulchella* recorded during the November 2010 surveys were located within high quality habitat as described in Section 6.2 below. On two occasions, three live *A. parapulchella* were recorded sheltering under the same rock (each rock was located within the cluster of recordings illustrated on Figure 2 and was approximately 30cm in diameter and 5-10cm thick). The microhabitats under the rocks turned during the surveys supported an abundance of invertebrate fauna including scorpions, centipedes, spiders and various species of ant (a particular abundance of ant eggs and larvae was noted). It is evident from the cluster of individuals recorded in the central-southern section of the Study Area that a substantial population of *A. parapulchella* occurs in this location. However, it is also apparent from the additional recorded locations of individuals elsewhere within the Study Area that the species is widespread throughout the Study Area and certainly not confined to the area of optimal habitat surrounding the recorded cluster.

Plates 1 and 2 below show examples of the *A. parapulchella* recorded during the November 2010 surveys.



Plate 1. One *A. parapulchella* found sheltering under a rock.



Plate 2. Three *A. parapulchella* found sheltering under the same rock.

6.2 Habitat Assessment and Mapping

Two features of the landscape are considered to be limiting habitat features for the presence of *A. parapulchella*; these features are described as follows.

1. Surface rocks – Presence of scattered small surface rocks with shallow embedment in the soil surface. *A. parapulchella* require these rocks to shelter under during spring and early summer as they aid in thermoregulation. As such, the presence of suitable shelter rocks is widely recognised as a limiting habitat feature for the presence of the species (Osborne *et al.* 1991, Osborne and Jones 1995, Osborne and Coghlan 2004). It is also known that the scatter density of suitable shelter rocks within an area of habitat is an indicator of the quality of the habitat and its ability to sustain a viable population (i.e. higher scatter density generally indicates higher quality habitat (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005).
2. Vegetation cover – High quality *A. parapulchella* habitat is characterised by a cover of native grasses, particularly dominated by Kangaroo Grass (*Themeda triandra*) and other native grasses and sedges including Red-leg Grass (*Bothriochloa macra*) and Wattle Mat-rush (*Lomandra filiformis*). Habitat suitability decreases with the presence of Speargrasses (*Austrostipa scabra* var. *falcata*, *A. bigeniculata*) and Tussock Grass (*Poa labillardieri*) and is greatly reduced by the presence of a considerable component of exotic pasture species and weeds (Osborne and Coghlan 2004; ACT Government 2007; ACT Government 2005). Suitability of habitat (and consequent presence of *A. parapulchella*) is reduced by tree and shrub cover (and associated leaf litter), however the species is still recorded within areas of open woodland which support the other limiting habitat features (i.e. native grass groundstorey and scattered surface rocks).

A component of this study has been to assess the quality and value of the *A. parapulchella* habitat throughout the Study Area in order to:

- inform the detailed design of the Googong Township regarding the areas of highest conservation value and opportunities that exist to offset the loss of habitat if necessary; and
- allow for an informed determination to be made regarding the significance the impacts upon *A. parapulchella* habitat that would occur during the development of the Googong Township.

With regard to the above, the Study Area has been segmented into areas of 'Very High', 'High', 'Medium' and 'Low' quality habitat for *A. parapulchella* using the ranking criteria detailed in Table 1 below. Representative photographs of each general vegetation cover type (excluding riparian vegetation) are provided as Plates 3 to 8 below.

Table 1 – A. *parapulchella* habitat quality assessment.

	Rock Scatter Density		
	High	Medium	Low
Vegetation Cover	1	2	3
	4	5	6
	7	8	9
	10	11	12
	13	14	15
	16	17	18
	19	20	21
<p>Native Themeda grassland – Predominantly undisturbed grassland (subject to recent low - moderate intensity grazing) dominated by or containing a significant component of Kangaroo Grass (<i>Themeda triandra</i>) and other native grasses, sedges and forbs including Red-leg Grass (<i>Bothriochloa macra</i>) and Wattle Mat-rush (<i>Lomandra filiformis</i>), Common Everlasting (<i>Chrysocephalum apiculatum</i>), Austral Bears-ear (<i>Cymbonotus lawsonianus</i>), and Pale Sundew (<i>Drosera peltata</i>). The small native shrub Grey Guinea Flower (<i>Hibbertia obtusifolia</i>) also occurs scattered throughout.</p> <p>Native Austrostipa grassland – Moderately disturbed grassland (subject to recent moderate intensity grazing) dominated by Corkscrew (<i>Austrostipa scabra</i> var. <i>falcata</i>) and Wallaby Grasses (<i>Austrodanthonia</i> spp.) and containing sparsely distributed Wattle Mat-rush (<i>Lomandra filiformis</i>). Exotic species include Flat Weeds (<i>Hypochoeris</i> spp.) and Clovers (<i>Trifolium</i> spp.).</p> <p>Open woodland over native grassland – Open woodland with a canopy consisting of Yellow Box +/- Blakely's Red Gum +/- Apple Box (<i>E. bridgesiana</i>) and a groundstorey dominated by native grasses, sedges and forbs including Red-leg Grass, Mat-rushes (<i>Lomandra longifolia</i> and <i>L. multiflora</i>), Native Geranium (<i>Geranium antrorsum</i>). Exotic species include scattered Sweet Briar (<i>Rosa rubiginosa</i>), African Boxthorn (<i>Lycium ferocissimum</i>), Flat Weeds, Clovers and Proliferus Pink (<i>Petrorhagia nanteuilii</i>).</p> <p>Exotic pasture – Exotic pasture dominated by Phalaris, Barley Grasses (<i>Hordeum</i> spp.), Perennial Ryegrass (<i>Lolium perenne</i>), Fescue (<i>Vulpia</i> spp.) and Cape Weed (<i>Arctotheca calendula</i>) with minor components of Wallaby Grasses.</p> <p>Open woodland over exotic pasture – Open woodland with a canopy consisting of Yellow Box (<i>Eucalyptus melliodora</i>) and Blakely's Red Gum (<i>E. blakelyi</i>) and a groundstorey dominated by exotic pasture species and weeds including Safron Thistle (<i>Carthamus lanatus</i>), Barley Grasses, Cape Weed, Mallow (<i>Mallow</i> spp.), Shepherd's Purse (<i>Capsella bursa-pastoris</i>) and Clovers.</p> <p>Dense shrubland – Dense shrubland dominated by Burchard (<i>Kunzea ericoides</i>), Shiny Cassinia (<i>Cassinia longifolia</i>) and Hopbush (<i>Dodonaea viscosa</i>) with a generally sparse to absent groundstorey.</p> <p>Native and exotic riparian vegetation – Mixed native and exotic riparian vegetation fringing Montgomery Creek. Dominant native species include River Tussock (<i>Poa labillardieri</i>), Tall Sedge (<i>Carex appressa</i>) and Common Rush (<i>Juncus usitatus</i>). Dominant exotic species include Serrated Tussock (<i>Nassella trichotoma</i>), Yorkshire Fog (<i>Holcus lanatus</i>) and Phalaris (<i>Phalaris aquatica</i>).</p>			

Legend

Aprasia Habitat Quality

Number = Polygon on Figure 2 (Note: Not all numbers are identified on Figure 2 as not all habitat permutations occur within the Study Area.)





Plate 3. Native *Themeda* grassland



Plate 4. Native *Austrostipa* grassland



Plate 5. Open woodland over native grassland



Plate 6. Exotic pasture



Plate 7. Open woodland over exotic pasture



Plate 8. Dense shrubland

7.0 RECOMMENDATIONS

It is clear that the Study Area supports a substantial population of *A. parapulchella*. Sections of the Study Area (notably areas identified as '1 – 2' on Figure 2) support 'Very High' quality habitat for *A. parapulchella*, consistent with that described for the species throughout the plentiful published literature available on the species (Refer Section 4.2 herein).

As the Study Area directly adjoins the Googong Foreshores (an area recognised as a significant area of habitat for *A. parapulchella*) along much of its eastern boundary, it can be envisaged that the population recorded within the Study Area is likely to comprise a component of the substantial contiguous population occurring throughout the Googong Foreshores and wider Queanbeyan River corridor.

Management measures recommended for incorporation into the detailed design and management of the Googong Township are detailed in Sections 7.1 and 7.2 below. The manner in which CIC proposes to incorporate these management measures is detailed in Section 8 below.

7.1 Management of Development Encroachment

Avoidance of development encroachment and other impacts upon the areas within the Study Area identified as supporting 'Very High', 'High' or 'Medium' quality habitat is recommended where practicable. In this regard, the following should be noted.

- Loss or significant disturbance of habitat identified as '1' or '2' on Figure 2 (considered 'Very High' quality habitat within the Study Area) would have an unacceptable impact and should be avoided.
- Loss or significant disturbance of sections of 'High' quality habitat identified as '4' on Figure 2 should be avoided where practicable. If the limited loss of habitat identified as '4' is unavoidable, it will be necessary to implement measures to offset for the loss. Recommended offset options are discussed in Section 7.2 below.
- Loss or significant disturbance of the areas of 'Medium' quality habitat (particularly relevant to areas identified on Figure 2 as '10' and '13') would be unlikely to have a significant impact upon the ongoing persistence of the population of *A. parapulchella* within the Study Area and locality. These areas whilst still providing 'Medium' quality habitat to the species, are outliers largely dominated by exotic groundstorey vegetation and with reduced connectivity to the 'Very High' quality habitat (identified as '1' or '2').
- Loss or significant disturbance of limited sections of the areas of 'Medium' quality habitat identified as '5' would be unlikely to have a significant impact upon the ongoing persistence of the population of *A. parapulchella* within the Study Area and locality. It should be noted however, that these areas (and the area of non-habitat between '5' and '4') have the potential to constitute contiguous 'High' Quality Habitat' if restored, rehabilitated and managed correctly.

7.2 Offsetting for Development Encroachment

Offsetting for the loss of limited areas of *A. parapulchella* habitat (excepting 'Very High' quality) could reasonably be achieved through two mechanisms. These are discussed as follows.

1. Direct Offsets –

- The rehabilitation of the gully located in the southeast of the Study Area. This would involve the removal of the Radiata Pine (*Pinus radiata*), the importation of suitable rocks removed during excavations carried out elsewhere in the Googong Township and the revegetation of the area with suitable native grasses (notably Kangaroo Grass and Redleg Grass). Note: to prevent importation of weeds, only rocks removed from adjacent sections of the Googong Township should be imported into the Study Area.
- The importation and placement of suitable rocks throughout the areas identified as '3'. Importing rocks into these areas would result in the habitat, in time, constituting 'Very High' quality habitat, thus improving habitat connectivity between the Study Area and the adjoining Googong Foreshores.
- The importation and placement of suitable rocks throughout sections of the area identified as '5' (in the southwest section of the Study Area) and the adjoining area of non-habitat located between '5' and '4'. It would also be necessary to carry out weed management and revegetation works (with native grasses) throughout these areas. These management measures would result in these areas, in time, constituting 'Very High' quality habitat, thus increasing the area of high quality contiguous habitat within the Study Area.

2. Indirect Offsets –

- Commissioning a broad-scale weed removal program to remove (via poisoning and physically removal) all non-native woody vegetation within the Study Area (i.e. Sweet Briar (*Rosa rubiginosa*), African Boxthorn (*Lycium ferocissimum*)).
- Commissioning a program to remove or substantially thin-out the areas which support dense stands of Burgan (*Kunzea ericoides*).
- Commissioning a targeted weed removal program to poison the Serrated Tussock (*Nassella trichotoma*) (approx 50 plants) located within the Montgomery Creek riparian zone. Eradication of this weed species is essential to prevent its spread and proliferation throughout the Study Area.
- Implementing an ongoing weed management program to reduce the weed infestations within the Study Area and to facilitate the eradication of woody weeds and significant weed species (i.e. Serrated Tussock).
- Commissioning a native grass revegetation/regeneration program throughout the Study Area, aimed at facilitating and encouraging the dominance of native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the Study Area where they are not currently the dominant

species. It is imperative that the revegetation/regeneration program is managed in a manner which maintains and enhances the grassland and grassy-woodland vegetation types required for the conservation of *A. parapulchella*.

- Preventing the collection of rocks within the Study Area (referred to as 'Bushrock Collection' which is a 'Key Threatening Process' for *A. parapulchella*).
- The removal or replacement of the fencing between the Study Area and the adjoining Googong Foreshores in order to allow the movement of Kangaroos between the two areas. An appropriate level of grazing by Kangaroos will assist in maintaining the grassland habitat desirable to *A. parapulchella*.
- Appropriate management of feral and domestic predators (primarily cats, dogs and foxes). A program should be implemented to manage feral cats and foxes within the Study Area. Such a program is likely to be best managed as an extension to the program implemented to manage such species within the Googong Foreshores (Googong Foreshores Draft Plan of Management 2007). In addition, measures should be put in place to prevent domestic cats and dogs from roaming within the Study Area.

8.0 PROPOSED MANAGEMENT

The following three principles have been applied by CIC in determining the proposed approach to the management of *A. parapulchella* within the Googong Township:

- excluding development from the 'Very High' quality areas of *A. parapulchella* habitat;
- providing a balanced outcome of urban development and a consolidated, contiguous Pink-tailed Worm-lizard Conservation Area (the 'PTWL Conservation Area') that reduces fragmentation and improves habitat for the species in the long term; and
- optimising the habitat connectivity of the PTWL Conservation Area to the adjoining Googong Foreshores.

These principles have been considered by CIC as 'objectives' to be met during the design and management of the Googong Township in order to facilitate development whilst ensuring that such development does not have a 'significant impact' (as defined pursuant to the Commonwealth EPBC Act) upon the population of *A. parapulchella* which occurs in the locality.

8.1 Establishment of PTWL Conservation Area

CIC proposes to establish and dedicate a PTWL Conservation Area (as illustrated on Figure 3) that will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. With regard to the location and extent of the proposed PTWL Conservation Area, the following salient points should be noted.

1. The entire 24.2 ha area of 'Very High' quality habitat would be retained and protected.
2. The majority (6.25 ha or 65.2%) of the 'High' quality habitat would be retained and protected. The loss of the balance 3.33 ha or 34.8% of 'High' quality habitat would be effectively compensated for by restoring and protecting 'Medium' quality habitat and areas of 'non-habitat', strategically located to increase habitat connectivity and reduce 'edge-effects'.
3. The majority (15.38 ha or 64.7%) of the area of 'Medium' quality habitat will be retained, protected and rehabilitated. The retained areas would be restored and, over time, become higher quality habitat.

With regard to the above, it must be noted that approximately 33.77 ha of 'Very High' and 'High' quality habitat currently exists within the Study Area (as illustrated on Figure 2). The PTWL Conservation Area proposed by CIC will, in time, encompass a total of approximately 51.87 ha containing a minimum of approximately 45.11 ha of 'Very High' or 'High' quality habitat. In addition to this long-term net increase in 'Very High' and 'High' quality habitat, the habitat restoration and management measures proposed by CIC (refer further detail under Section 8.2 below) will:

- substantially improve habitat quality within the PTWL Conservation Area;
- maintain and improve connectivity within the PTWL Conservation Area; and
- improve connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores.

8.2 Management of PTWL Conservation Area

The following management measures would be implemented to protect and enhance the *A. parapulchella* habitat within the PTWL Conservation Area.

8.2.1 Initial works to be undertaken by CIC Australia

CIC proposes to dedicate the PTWL Conservation Area to an appropriate party (e.g. Queanbeyan City Council, Googong Community Association or similar), for ownership and management in perpetuity. The following management measures would be implemented by CIC prior to dedication and handover.

1. The restoration of the areas indicated on Figure 3 with the objective of creating 'Very High' or 'High' quality habitat in the long-term. The specific restoration measures that would be required will be dependant upon the current conditions within the specific areas to be restored and may involve:
 - the removal of the exotic woody vegetation (Radiata Pine (*Pinus radiata*), Sweet Briar (*Rosa rubiginosa*), African Boxthorn (*Lycium ferocissimum*) etc);
 - the removal or substantial thinning-out of Burgan (*Kunzea ericoides*);
 - the importation of suitable rocks removed during excavations elsewhere in the Googong Township; and
 - the revegetation of the area with suitable native grasses (notably Kangaroo Grass (*Themeda triandra*) and Redleg Grass (*Bothriocloha macra*)).
2. The establishment of a 20 m wide 'Buffer Zone' around the boundary of the PTWL Conservation Area (refer Figure 3). This 'Buffer Zone' would be regularly monitored and any disturbance or additional weed establishment / encroachment would be promptly and sensitively controlled.
3. An appropriate salvage program will be implemented to capture *A. parapulchella* individuals prior to and during excavation works conducted in the area surrounding the PTWL Conservation Area. This program will involve the appointment of a suitably qualified and experienced person (Zoologist, Ecologist or similar) to turn all suitable shelter rocks in the areas to be disturbed, prior to disturbance. This person would also be present during the initial disturbance (soil scraping, rock removal etc). All live *A. parapulchella* captured would be immediately moved into the adjacent PTWL Conservation Area and released at the base of a suitable shelter rock.
4. Commissioning a broad-scale weed removal program to remove (via poisoning and physical removal) all non-native woody vegetation within the PTWL Conservation Area (primarily Sweet Briar and African Boxthorn).
5. Commissioning a targeted weed removal program to poison the Serrated Tussock (*Nassella trichotoma*) (approx 50 plants) located within the Montgomery Creek riparian zone. Eradication of this weed species is essential to prevent its spread and proliferation throughout the PTWL Conservation Area.
6. Commissioning a native grass revegetation/regeneration program throughout the PTWL Conservation Area, aimed at facilitating and encouraging the dominance of

native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the Study Area where they are not currently the dominant species.

7. Boundary minimisation. The boundary between the PTWL Conservation Area and the adjacent residential areas will be the area where 'edge effects' are most relevant and would require the highest degree of ongoing management. As such, all reasonable efforts would be made to minimise the length of the boundary between the PTWL Conservation Area and the adjacent residential areas (this has been effectively achieved in the proposed design of the PTWL Conservation Area (refer Figure 3).
8. Construction of boundary fencing. Rural type fencing (without barbed wire) would be sufficient to delineate the boundary of the PTWL Conservation Area and would be installed. The installation of gates into the PTWL Conservation Area would be restricted to those required to provide access to management personnel.
9. Facilitation of Kangaroo grazing. Kangaroo grazing throughout the PTWL Conservation Area would be facilitated and encouraged as it would assist in maintaining the grassland habitat for *A. parapulchella* and reduce fuel loads. To achieve this, fencing between the PTWL Conservation Area and the adjoining Googong Foreshores would include an appropriate gap along the Montgomery Creek corridor to enable movement of Kangaroos between the two areas.
10. Sealed roads/streets would be constructed around the boundary of the PTWL Conservation Area with residential lots located on the opposite side of the road/street. The placement of roads in this manner is effective in discouraging the dumping of rubbish and often well intentioned (however highly environmentally degrading) practice of spreading lawn clippings throughout the grassland over the back fence. Care would be taken to ensure that any topsoil placed between the road and the boundary fence is not contaminated with weed seed etc.
11. An appropriate domestic animal containment program would be implemented and enforced within the Township (Note: CIC have proposed to implement a domestic cat containment program throughout the entire Googong Township).
12. An appropriate community education program would be designed and implemented in consultation with relevant experts.

8.2.2 Ongoing management works

A management plan (prepared in accordance with the NSW Local Government Act) would be prepared which would set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the PTWL Conservation Area is appropriately protected and habitat enhancement continues in perpetuity. This management plan would include:

- details relating to the ongoing weed management program implemented to reduce the weed infestations within the PTWL Conservation Area and to facilitate the eradication of woody weeds and significant weed species (i.e. Serrated Tussock);
- details regarding an appropriate ongoing native species regeneration and management program; and
- details regarding the weed management program and any Asset Protection Zone fuel reduction works required.

CIC will work collaboratively with the eventual land owner/manager(s) to manage the handover of bush regeneration and other measures commenced by CIC.

9.0 IMPACT ASSESSMENT – EPBC ACT 1999

The EPBC Act provides guidelines for assessing the impact of an activity on any Matter of National Environmental Significance (MNES). The EPBC Act identifies seven MNES:

- World Heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and,
- Nuclear actions (including uranium mining).

The EPBC Act establishes requirements for assessing the impact of proposed activities or actions on any Matter of National Environmental Significance. If a proposed action has the potential to incur a significant direct or indirect impact on any threatened or migratory species or ecological communities (or their habitats) listed under the Act then the proposed action must be 'Referred' to DSEWPC for further consideration.

The 'significant impact criteria' (Commonwealth of Australia 2008) are designed to assist in determining whether the impacts of a proposed action on any MNES are likely to be significant impacts. The criteria provide general guidance on the types of actions that will require approval and the types of actions that will not require approval. They are not intended to be exhaustive or definitive.

The potential impact on the Nationally listed threatened species *A. parapulchella* has been considered in this assessment in accordance with the impact assessment criteria, *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Commonwealth of Australia 2008). An assessment of significance has been prepared and is provided below.

With reference to the above, it is noted that the impact assessment criteria under the EPBC Act are largely equivalent to those provided under the NSW TSC Act (i.e. the Seven Part Test). In this regard, the following impact assessment is considered an appropriate assessment of impacts as relevant to both the EPBC Act and the TSC Act.

EPBC Act Assessment of Significance

The Pink-tailed Worm-lizard is listed as Vulnerable under the EPBC Act.

Is there a real chance or possibility the action will lead to a long-term decrease in the size of an important population of a species?

The proposed development footprint for the Googong Township has been configured to retain and protect the entire approximate 24.2 ha area of 'Very High' quality habitat within the Googong Township area. This area of habitat is considered to constitute 'Very High' quality habitat for *A. parapulchella* as it supports:

- a medium to high density of suitable shelter rocks;
- high quality to optimal vegetation cover (i.e. Kangaroo Grass dominated native grassland); and
- good connectivity to expansive areas of similar habitat located within the adjoining Googong Foreshores.

In addition to the above, the majority of the *A. parapulchella* recorded during the targeted surveys conducted throughout the Study Area were recorded within the area identified as 'Very High' quality habitat.

Notwithstanding the above, the proposed development of the Googong Township will involve the initial loss of approximately:

- 3.33 ha (34.8%) of the area within the Googong Township determined to constitute 'High' Quality Habitat';
- 8.39 ha (35.3%) of the area within the Googong Township determined to constitute 'Medium' quality habitat; and
- 0.17ha (6.5%) of the area within the Googong Township determined to constitute 'Low Quality Habitat'.

In order to offset the above described loss of *A. parapulchella* habitat, CIC proposes to establish, rehabilitate and dedicate to public ownership, a 52 ha PTWL Conservation Area. With regard to the location and extent of the proposed PTWL Conservation Area, the following salient points should be noted.

1. The entire 24.2 ha area of 'Very High' quality habitat would be retained and protected.
2. The majority (6.25 ha or 65.2%) of the 'High' quality habitat would be retained and protected. The loss of the balance 3.33 ha or 34.8% of 'High' quality habitat would be effectively compensated for by restoring and protecting 'Medium' quality habitat and areas of 'non-habitat', strategically located to increase habitat connectivity and reduce 'edge-effects'.
3. The majority (15.38 ha or 64.7%) of the area of 'Medium' quality habitat will be retained, protected and rehabilitated. The retained areas would be restored and, over time, become higher quality habitat.

In addition to the above, CIC proposes to work collaboratively with the eventual land owner/manager(s) to implement the following management measures to protect and enhance in the long-term, the *A. parapulchella* habitat within the PTWL Conservation Area.

1. Restoration of extensive sections of the PTWL Conservation Area with the objective of creating 'High' quality habitat in the long-term. Specific details of the restoration measures that would be implemented are provided in Section 8.2 of this report.
2. Commissioning a broad-scale weed removal program to remove and manage weeds within the PTWL Conservation Area.
3. Commissioning a native grass revegetation/regeneration program throughout the PTWL Conservation Area, aimed at facilitating and encouraging the dominance of native grasses (notably Kangaroo Grass and Redleg Grass) within the areas of the PTWL Conservation Area where they are not currently the dominant species.
4. Boundary minimisation (to facilitate the minimisation of 'edge effects') and construction of appropriate boundary fencing.
5. Commissioning the preparation of a management plan which would set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the PTWL Conservation Area is appropriately protected and habitat enhancement continues post dedication to handover. Specific details of the restoration measures that would be implemented are provided in Section 8.2 of this report.

it must be noted that approximately 33.77 ha of 'Very High' and 'High' quality habitat currently exists within the Study Area (as illustrated on Figure 2). The PTWL Conservation Area proposed by CIC will, in time, encompass a total of approximately 51.87 ha containing a minimum of approximately 45.11 ha of 'Very High' or 'High' quality habitat. In addition to this long-term net increase in 'Very High' and 'High' quality habitat, the habitat restoration and management measures proposed by CIC (refer further detail under Section 8.2 of this report) will:

- substantially improve habitat quality within the PTWL Conservation Area;
- maintain and improve connectivity within the PTWL Conservation Area; and
- improve connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores.

With regard to the above, it can be determined that the approach proposed by CIC will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. This net-benefit will work to facilitate a long-term increase in the population size of the population of *A. parapulchella* within the PTWL Conservation Area.

The proposed action is unlikely to lead to a long-term decrease in the size of an important population of *A. parapulchella*.

Is there a real chance or possibility the action will reduce the area of occupancy of an important population?

The *A. parapulchella* population associated with the Googong Foreshores and surrounds is considered to constitute an important population. As described above, the proposed development of Googong Township will result in an initial reduction in the area of *A. parapulchella* habitat within the Googong locality. This initial reduction will however, be more than offset via the dedication of the PTWL Conservation Area and associated extensive measures proposed to protect the population and increase and enhance habitat for the species.

The proposed action is unlikely to reduce the area of occupancy of an important population.

Is there a real chance or possibility the action will fragment an existing important population into two or more populations?

The Study Area directly adjoins the Googong Foreshores (an area recognised as a significant area of habitat for *A. parapulchella*) along much of its eastern boundary. In this regard, it can be envisaged that the population recorded within the Study Area is likely to comprise a component of the substantial contiguous population occurring throughout the Googong Foreshores and wider Queanbeyan River corridor.

The proposed location and extent of the PTWL Conservation Area has been determined in a manner which aims to substantially enhance habitat connectivity between the PTWL Conservation Area and the adjoining Googong Foreshores. In addition, the proposed PTWL Conservation Area will encompass the entire area of 'Very High' quality habitat within the Googong Township and the majority of the 'High' and 'Medium' quality habitat. The significant habitat protection and restoration works proposed within the PTWL Conservation Area will act to increase the area of 'High' quality habitat, improve habitat connectivity and consolidate habitat and associated populations of *A. parapulchella*.

The proposed action is unlikely to fragment an existing important population into two or more populations.

Is there a real chance or possibility the action will adversely affect habitat critical to the survival of a species?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. A Register of Critical Habitat is maintained by the Minister under the EPBC Act. To date, no critical habitat has been listed for the Pink-tailed Legless Lizard (DEWHA 2008b). Whilst the *A. parapulchella* habitat within the Study Area is considered to be important to the preservation of the species, it is not of any higher or more ‘critical’ importance than that which occurs throughout the wider Googong Foreshores and Queanbeyan and Molonglo River Corridors. Nevertheless, as described above, significant land dedication and habitat restoration works are proposed as part of the development of the Googong Township. These measures will act to facilitate the long-term protection and enhancement of the habitat and associated population.

The proposed action will not adversely affect habitat critical to the survival of *A. parapulchella*.

Is there a real chance or possibility the action will disrupt the breeding cycle of an important population?

The Pink-tailed Legless Lizard is a fossorial species, which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae (Osborne and Jones 1995). The Pink-tailed Legless Lizard is oviparous (egg laying) with a clutch size of two. Females may need to reach an age of about 3 or 4 years before they can reproduce. There is little data on the breeding behaviour of this species. The Pink-tailed Legless Lizard is thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter (DEC 2005).

As described above, the proposed development of the Googong Township will result in an initial reduction in the area of *A. parapulchella* habitat within the Googong locality. It is proposed to offset this loss of habitat via the dedication, restoration and ongoing management of the PTWL Conservation Area incorporating all ‘Very High’ quality habitat and the majority of the balance habitat within the Googong Township. In this regard it is considered unlikely that the proposed action will disrupt the breeding cycle of the population occurring within the Study Area and adjoining Googong Foreshores.

The proposed action is unlikely to disrupt the breeding cycle of an important population.

Is there a real chance or possibility the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

As detailed herein, the proposed establishment, restoration and ongoing management of the PTWL Conservation Area will act to increase the area of high quality contiguous *A. parapulchella* habitat within the Googong Township. In this regard, the *A. parapulchella* management measures proposed as part of the development of the Googong Township will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality. The objective to be achieved in this manner is to facilitate the long-term protection and enhancement of the population and thus prevent any decline in the local population.

The action will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is there a real chance or possibility the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Feral European Rabbits (*Oryctolagus cuniculus*) were detected within the Study Area during the recent surveys. This species has been identified as an invasive species which suppresses the regeneration of natural grasses and forbs (NSW Scientific Committee 2002). The damaging grazing by Feral European Rabbits is likely to adversely impact upon *A. parapulchella* by reducing the abundance of native grasses. The proposed development of the Googong Township is not considered likely to increase the abundance or spread of the Feral European Rabbit within the PTWL Conservation Area or wider locality.

Several significant weed species and numerous exotic pasture species were identified as already being established within the Study Area (refer details provided in this report). The management plan that will be commissioned by CIC will set out appropriate objectives, milestones and assessment criteria to be achieved in order to ensure that the existing weed infestation within the PTWL Conservation Area are appropriately managed and/or eradicated. The management plan will also provide management measures to be implemented to ensure that additional exotic species do not become established within the PTWL Conservation Area.

Additional invasive plant species that may be detrimental to *A. parapulchella* are not likely to become established in this area as a result of the proposed action.

Is there a real chance or possibility the action will introduce disease that may cause the species to decline?

It is considered unlikely that the proposed action would introduce any diseases that may cause the species to decline.

Is there a real chance or possibility the action will interfere substantially with the recovery of the species?

The main recovery objectives for *A. parapulchella* as described in the 'National Recovery Plan for the Pink-tailed Worm-lizard *A. parapulchella* (Draft)' (Brown 2010) are as follows.

1. Refine knowledge of distribution and abundance.

The commissioning of this study has occurred in order to inform the proposed development of the Googong Township. The subsequent completion of the targeted field surveys and habitat assessment has acted to provide further information and refinement regarding the previously known distribution of *A. parapulchella* within the locality.

2. Protect and enhance habitat.

As detailed herein, a component of the proposed development of the Googong Township will be the establishment, dedication, protection and enhancement of the *A. parapulchella* habitat within a dedicated PTWL Conservation Area.

3. Minimise predation by introduced predators.

Measures would be implemented (detailed in the management plan to be developed) to suitably control introduced predators and thus minimise predation by same.

4. Investigate the optimal fire regime.

Advice resulting from investigations completed on the optimal fire regimes for *A. parapulchella* will be incorporated into the management plan to be developed.

5. Minimise disturbance by recreational activities.

Management measures relating to preventing detrimental recreational activities would be detailed in the management plan to be developed.

6. Investigate the ecology of *A. parapulchella* and impacts of disturbances on population survival.

7. Monitor management effectiveness.

The management plan for the PTWL Conservation Area will include a monitoring component to monitor the effectiveness of the management measures and regime implemented. A degree of 'adaptive management' will be incorporated into the management plan in order to allow amendments to be made to the management regime as deemed necessary.

8. Build community support for conservation.

CIC propose to implement an appropriate community education program. The management plan will provide details pertaining to the specific community education measures to be implemented.

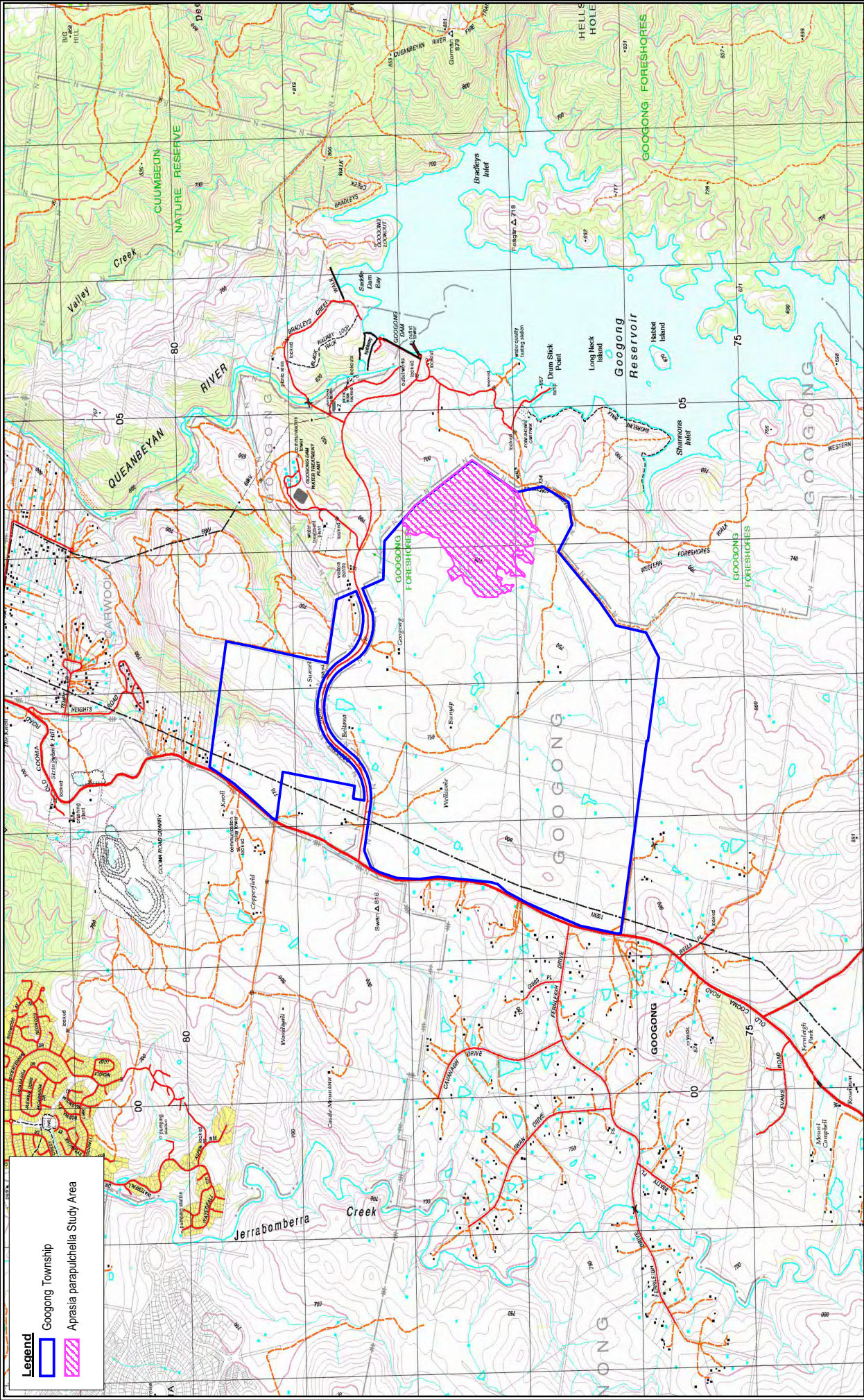
The proposed development of the Googong Township will complement and certainly not interfere with the above listed recovery objectives for *A. parapulchella*.


Conclusion

The loss of the areas of *A. parapulchella* habitat as indicated on Figure 2 (i.e. that located outside of the proposed PTWL Conservation Area) would be effectively offset by incorporating the PTWL Conservation Area design illustrated on Figure 3 and management measures detailed under Section 8.2 of this report. As detailed herein, it is determined that:

- the proposed location and extent of the PTWL Conservation Area (as illustrated on Figure 3) will result in a qualitative and quantitative long-term net-benefit to *A. parapulchella* habitat within the locality; and
- the proposed approach will ensure that the proposed development of the Googong Township will be unlikely to have a 'significant impact' (as defined under the Commonwealth EPBC Act Significant Impact Guidelines (refer Section 9 herein)).

FIGURES





BIOSIS RESEARCH Pty. Ltd.
Unit 16/2 Yaloum St
Fyshwick
AUSTRALIAN CAPITAL
TERRITORY 2609

Figure 1: Locality Plan.

Date: 16 December 2010	Drawn by: ANP
File number: 12364	Checked by: RS
Location: .P\12306\12364\Mapping\12364_F1_Overview.WOR	

Acknowledgements:
Topographic image from Land and Property Management Authority
1:25000 topographic map series (2006)
This product incorporates data which is copyright to
the Commonwealth of Australia (c.2003-)

Scale: 1:25,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

0 0.25 0.5 0.75 1.0 1.25
kilometres

Figure 1

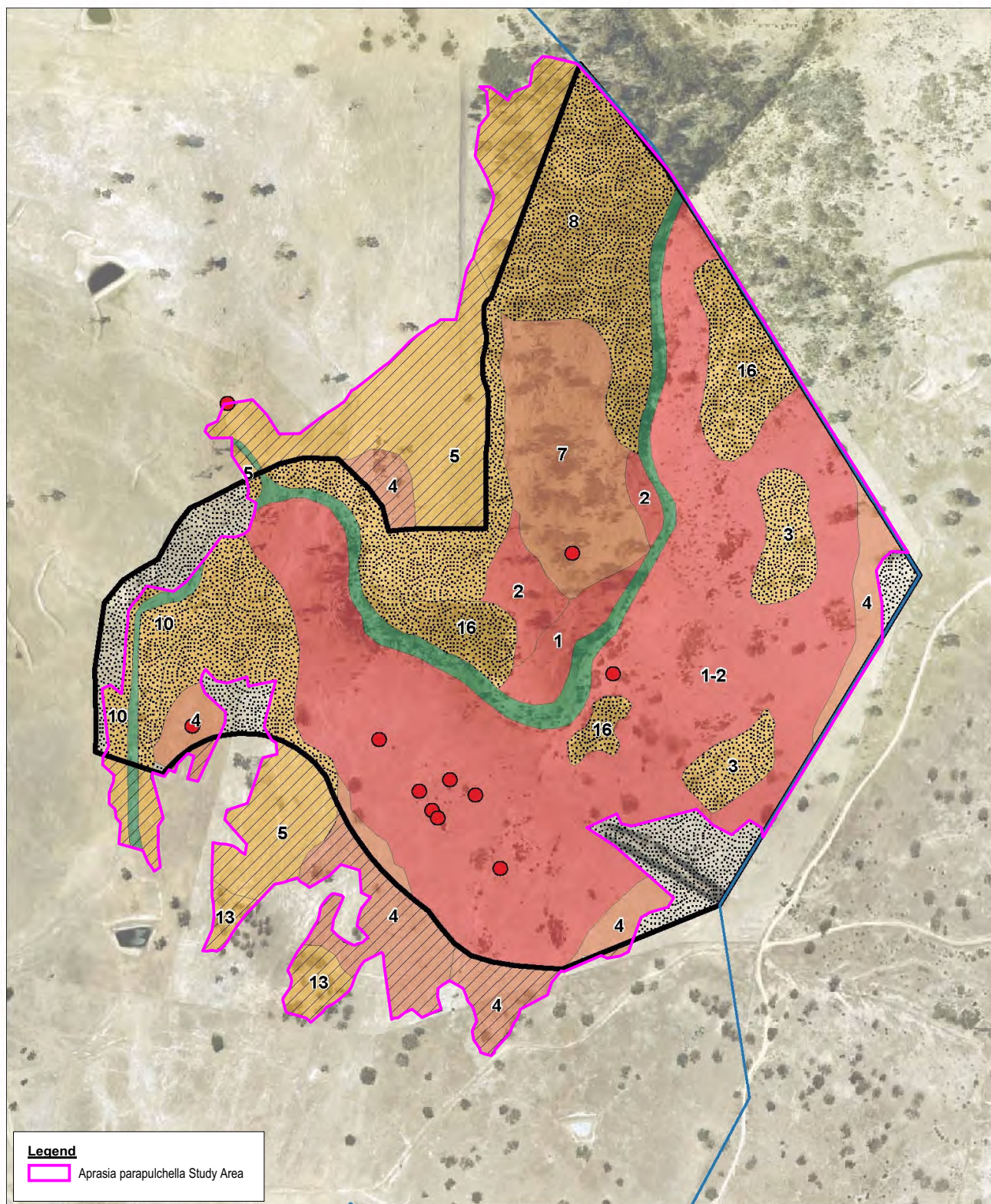
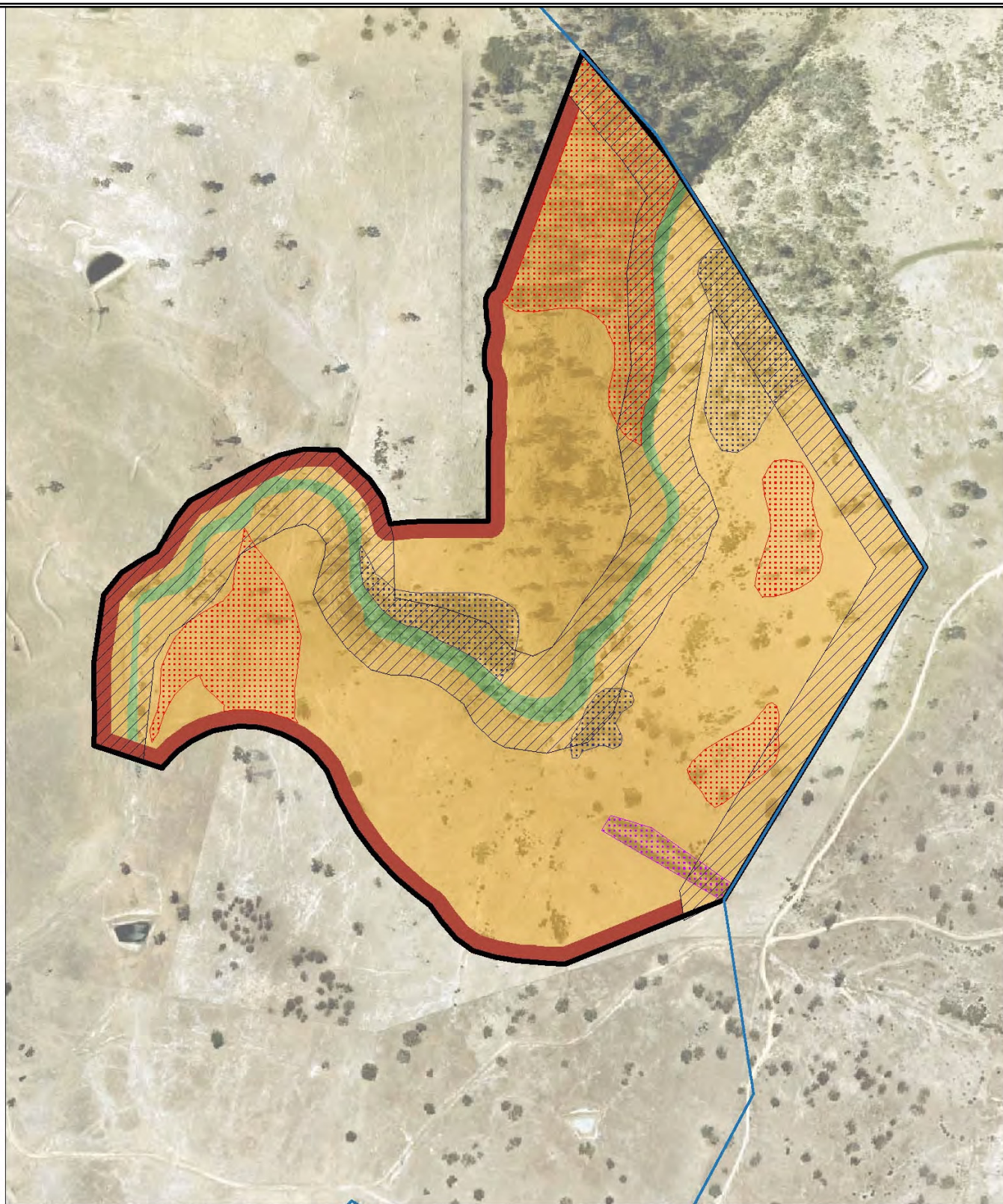


Figure 2: Habitat Quality Assessment and Proposed PTWL Conservation Area.

Date: 14 January 2011	Drawn by: ANP
File number: 12364	Checked by: RS
Location: ...P:\12300s\12364\Mapping\12364 F2_Habitat Quality Asses.WOR	



Goongong Commonwealth referral

Proponent CIC Australia

Date 6 January 2011

Drawing no. 09096g_epbc_fig1b

Source CIC, RobertsDay

- Proposed action boundary
- E2 within PTWL area - 18.78 Ha
- Montgomery Creek zone - 2.62 Ha
- 20m buffer zone - 4.21 Ha
- Aprasia habitat zone - 45.04 Ha
- PTWL conservation area - 51.87 Ha
- Rock replacement - 8.01 Ha
- Pinus radiata removal - 0.44 Ha
- Scrub thinning - 3.13 Ha

1:6,000

0 50 100 150 200m



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Manidis Roberts
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Figure 3: PTWL Conservation Area - Proposed Management Zones.

Date: 14 January 2011	Drawn by: ANP
File number: 12364	Checked by: RS
Location:...	
P:\12300s\12364\Mapping\12364 F3_Proposed Management Zones.WOR	



Figure 3

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Appendix D Clarification of aspects of the stormwater management strategy

/jl
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COMMENTS_REV3_20110413.DOC

13 April 2011

Mr Craig Harris
CIC Australia Pty Ltd
Level 3, 64 Allara St
CANBERRA ACT 2601

Dear Craig,

**Response to Part 3A submission comments on stormwater management at
Googong township**

Brown Consulting would like to offer the following response to comments received regarding the exhibited Part 3A Concept Plan and Stage 1 Project Application for the Googong township's Integrated Water Cycle (IWC).

The work undertaken by Brown Consulting on the stormwater management relates to the whole of the Googong township, with more specific attention given the so called "Googong Creek" catchment, within which will be located the first neighbourhood of the township (Neighbourhood 1A).

This letter provides a summary of, and offers some clarification to, the extensive work that was undertaken over a period of four years and documented in the Part 3A Environmental Assessment (at Appendix M of that document). It should be noted that the stormwater management system is primarily part of the subdivision design, which is administered and approved by Queanbeyan City Council under Part 4 of the NSW EP&A Act.

Philosophy and principles of the stormwater management strategy

The fundamental philosophy of the stormwater strategy for Googong township has been to carefully assess and analyse the implications of an urban development in an existing rural catchment to ensure that post-development flows mimic pre-development conditions in terms of peak discharge and key pollutant loads as well as ensuring ambient water quality is maintained in downstream waterways in accordance with Queanbeyan City Council and NSW Government regulatory requirements.

The key principles that were central to the development of the stormwater management strategy and associated work were to:

1. Define the framework of a stormwater management strategy for the Googong township, based on the existing topography and site constraints;

2. Manage the impacts of catchment urbanisation (higher degree of imperviousness, more “reactive” catchment to rainfall) and minimise the potential detrimental impacts on the downstream receiving environment (such as increased peak flows, urban stormwater pollutants generation), including Googong Creek downstream of Googong Dam Road and the Queanbeyan River;
3. Design a strategy and an integrated series of measures to control stormwater quantity and quality to meet the specific targets set by Queanbeyan City Council particularly in ensuring post-development peak discharge and ambient water quality mimic pre-development conditions. Brown Consulting’s approach has also been based on relevant industry standards, Australian Standards and local, NSW and Australian regulations, policies and guidelines;
4. Consider both stormwater quantity management and stormwater quality management requirements in order to mitigate the impact of urbanisation of the catchments;
5. Integration of the stormwater management strategy and measures with the integrated water cycle management at Googong, including the discharge of excess recycled water into the stormwater system, integration with landscaping and provision of a network of linkages to support biodiversity.

Some technical elements of the modelling and analyses carried out.

Limited site specific flow information was available for the site. The modelling and analysis approach selected for the project included a combination of hydrological, hydraulic and water quality models that were calibrated to earlier preliminary studies (e.g., Northrop, 2004) as well as Australian ungauged catchment hydrological method (Probable Rational Method). This method is an industry wide standard used on most ungauged catchments in Australia and accepted by Agencies in situations of limited or poor actual monitoring data.

The modelling undertaken was used to compare a number of scenarios including pre-development conditions and post-development scenarios, analysis of the possible excess flows of recycled water out of the Googong water recycling plant, and climate change scenarios.

It is Brown Consulting’s professional judgement that the method used was the most appropriate for the task.

Stormwater Management Strategy Outcomes

The strategy developed consisted of a number of measures creating a stormwater treatment train including raingardens, swales, bioretention pods and ponds. Our analysis demonstrated that with or without recycled water flows, stormwater quality leaving the Googong township site below Googong Dam Road will be meeting all the applicable water quality parameter targets (nitrogen, phosphorus and suspended solids).

The results also show that there will be no changes to the peak of stormwater flows leaving the site. We acknowledge that there will be modification to the hydrological regime Googong Creek with more regular flows. It is our opinion that more frequent flows will contribute to improving the health of downstream waterways including the Murrumbidgee and the Murray Darling Basin. The results show the compliance with all applicable criteria from local, state and Australian government.

An evolutive and flexible strategy

The strategy designed for Googong township is robust and flexible. It will allow adjusting and modification as the project develops in stages. Googong township will take some 25 years to be fully developed. This extended development period means that for each new stage, the stormwater design is able to be based on a review of the performance of the current stormwater management measures. It will also look at the latest innovation for the stormwater industry. Where suitable, new technologies and approaches will be brought into developing the most appropriate mitigation response to the changes in land use in the Googong catchment. It should be noted that this will be supported by a series of monitoring programs including monitoring of flows in Googong Creek at Googong Dam Road (as part of Part 4 approvals) as well as in Queanbeyan River (as part of Part 3A approvals).

Climate change considerations

Brown Consulting acknowledges the issues of climate change and the potential impacts on temperature, evaporation, soil moisture content, rainfall patterns, etc. The water industry and the Australian Institution of Engineers are currently revising the applicable methods and tools for undertaking hydrological modelling and be able to perform scenario analysis to support risk management approaches.

In the interim, we have applied the best available scientific knowledge and guidelines (using for example CSIRO projections for the Murrumbidgee catchment) and over 40 years of local rainfall data as identified in Queanbeyan City Council stormwater design standards to assess the potential impact of climate change for our hydrological models. This approach is the most appropriate at this point in time, and given the flexibility in our strategy, as highlighted above, will allow the design of future stages to adjust and adapt the system to include new scientific knowledge and tools as they become available.

Brown Consulting has applied the highest professional standards in undertaking the development of the stormwater strategy and its integration with the urban planning and water recycling plant project. The best available scientific knowledge has been used wherever possible and sound professional judgement applied to bridge gaps in information. The proposed design response is flexible and adaptive, to ensure the strategy can be adapted over the 25 year timeframe for the project and our analysis has shown the absence of detrimental impacts and compliance with relevant legislation, design codes, guidelines, and industry standards.

Yours sincerely

BROWN CONSULTING (ACT) PTY LTD



Julien Lepetit
Manager Water & Environment



Tony Connell
Manager Urban Development

Appendix E Submissions

Our Ref: 374DA23 (10/1500) STH10/00256
Contact: Tim Webster 4221 2769
Your Ref: S08/01819, MP08_0236



08 DEC 2010

Manager – Water Projects
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Department of Planning
Received
9 DEC 2010
Scanning Room



Attention: Swati Sharma

QUEANBEYAN CITY COUNCIL – MAJOR PROJECT 08_0236, – MR584, OLD COOMA ROAD, GOOGONG – GOOGONG WATER CYCLE PROJECT

Dear Madam

Reference is made to your letter dated 10 November 2010 regarding the subject major project application forwarded to the Roads and Traffic Authority (RTA) for consideration.

The RTA has reviewed the submitted information and does not object to the development application in principle as the intersection of Old Cooma Road and Googong Dam Road is considered adequate to cater for the traffic generation associated with the construction and operation of the proposal.

In accordance with Section 79C(1)(b) of the EP&A Act, Council as the Consent Authority, is responsible to consider any likely impacts on the natural or built environment in the road reserve fronting this proposed development. For instance there could be traffic noise impacts on adjacent residences, impacts on indigenous or non-indigenous heritage items or threatened species. The RTA will not be making a separate Part 5 environmental assessment of the environmental impacts in the road reserve for this proposal.

Yours faithfully

Adam Berry
Manager, Road Safety and Traffic Management
Southern Operations and Engineering Services



GREATER SOUTHERN AREA HEALTH SERVICE NSW HEALTH

#2

Incorporating

Health Services
Adelong
Albury
Ardlethan
Barellan
Barham
Barmedman
Batlow
Batemans Bay
Bega
Berrigan
Bombala
Boorowa
Braidwood
Coolamon-
Ganmain
Coleambally
Cooma
Cootamundra
Corowa
Crookwell
Culcairn
Darlington Point
Delegate
Deniliquin
Eden
Finley
Goulburn
Griffith
Gundagai
Gunning
Hay
Henty
Hillston
Holbrook
Jerilderie
Jindabyne
Junee
Leeton
Lockhart
Mathoura
Moama
Moruya
Moulamein
Murrumburrah-
Harden
Narooma
Narrandera
Pambula
Queanbeyan
Tarcutta
Temora
The Rock
Tocumwal
Tooleybuc
Tumbarumba
Tumut
Ungarie
Urana
Wagga Wagga
Weethalle
West Wyalong
Yass
Young

13th December 2010

Department of Planning
GPO Box 39
SYDNEY NSW 2001

Attention: Lisa Mitchell
Manager Water Projects
Infrastructure Projects

Dear MS Mitchell,

**Re: Environmental Assessment for Googong Water Cycle Project
Major Project 08_0236**

Thank you for the invitation for comment and submission on the Googong Water Cycle Project.

On revision of the report the following comments are offered:

1. Water provided as drinking water to the development is to comply with the Australian Drinking Water Guidelines 2004. The ongoing management and monitoring of the supply is to form part of the NSW Drinking Water Monitoring Program
2. The recycled water treatment system is to be considered in relation to the Australian Guidelines for Water Recycling and the Interim NSW Guidelines for Management of Private recycled Water Schemes 2008. The recycled water treatment system is subject to approval by the relevant authorities.
3. The stormwater management strategy is to consider the impact of receiving excess recycled water and water recycling plant emergency overflows. Consideration should be given not only to the quantity but also quality of recycled water being received into the stormwater system and the subsequent impact on the receiving watercourses.

Population Health
P O Box 3095
ALBURY NSW 2640
Phone: 02 60808901
Fax: 02 60808999

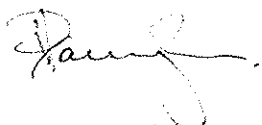
**Better Health for
Rural Australia**

Greater Southern Area Health Service
ABN 32 238 346 308
GPO Box 1845 (34 Lowe Street) Queanbeyan NSW 2620
Tel (02) 6128 9777 Fax (02) 6299 6363
Email corporate@gsahs.health.nsw.gov.au
Website www.gsahs.nsw.gov.au

4. Open water bodies, including but not limited to creeks, stormwater channels, retention ponds and water features located within the development are to receive consideration in relation to mosquito control and the incidence of algal blooms.
5. As noted in the Report the project may have consequential impacts on the Googong Dam and foreshores due to an increase in adjacent population and the possible increase in recreational activities on and around the dam. Appropriate management measures should be considered to negate any negative impact of activities on the water catchment area, the foreshore environment and water quality.
6. Emergency management requires consideration in the event of a disaster. Consideration should be given to ingress and egress as well as points of evacuation, both during each of the construction stages as well as on completion of the project.

If anything further is required please advise.

Yours faithfully



Peter Harrington
Environmental Health Office
Greater Southern Area Health Service



Industry &
Investment

#3

Your Ref: S08/01819

Our Ref: OUT10/20353

Lisa Mitchell
Manager – Water Projects
Infrastructure Projects
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Dear Ms Mitchell,

**Re: MP08_0236 – Environmental Assessment – Proposed Googong Township
Water Cycle Project.**

Thank you for your letter dated 10 November 2010 seeking Industry & Investment NSW (I&I NSW) comments on the Environmental Assessment (EA) for the above Major Project.

This is a joint response from I&I NSW providing comments on Fisheries and Agriculture issues related to this proposal which are detailed in Attachments A and B. I&I NSW advises that there are no issues related to Minerals or State Forests.

Should you have any general queries please contact Dr Trevor Daly on (02) 4478 9103. For further specific information on Agriculture issues please contact the relevant officer listed in the Attachment.

Yours sincerely

BILL TALBOT
DIRECTOR, FISHERIES CONSERVATION & AQUACULTURE

17 December 2010

ATTACHMENT A – FISHERIES ISSUES

I&I NSW is responsible for ensuring that fish stocks are conserved and that there is "no net loss" of key fish habitats upon which they depend. To achieve this, the Department ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act respectively) and the associated *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation* (1999). In addition the Department is responsible for ensuring the sustainable management of commercial and recreational fishing and aquaculture within NSW.

I&I NSW notes that the proposed water cycle project is located in the catchments of Googong Creek and Montgomery Creek which drain to the Queanbeyan River. The potential impact of the development upon water quality and aquatic habitats in Googong Creek, Montgomery Creek and downstream in the Queanbeyan River is of particular interest to this Department in relation to this Major Project.

I&I NSW has reviewed the Environmental Assessment (EA) prepared by Manidis Roberts P/L (dated November 2010). Overall, I&I NSW has no objection to approval of the proposal as outlined in the EA and Appendices (including Statement of Commitments and site plans) but makes the following comments and recommendations:

1. I&I NSW concurs with the proposed development and implementation of a construction environmental management plan (CEMP) (incorporating soil and water and spill management plans) and an operation environmental management plan (OEMP) (C1, WQ1, WQ2, WQ5, S2 – Table 18.1).
2. I&I NSW concurs with the proposed implementation of a water quality and aquatic ecology monitoring program for the Queanbeyan River (including water quality, flow, fish migration, macrophytes and macroinvertebrate communities) to be developed in consultation with I&I NSW (WQ4, A1 – Table 18.1).
3. I&I NSW recommends that any proposed new or upgraded road crossings of Googong Creek and Montgomery Creek must be designed and constructed in accordance with the Department's *Policy and Guidelines for Fish Friendly Waterway Crossings* (2004) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (2004). The design of any road crossings of these waterways should be submitted to I&I NSW for approval prior to construction.
4. I&I NSW concurs with the proposed mitigation measures for water quality and hydrology (Section 7 of EA) and Ecology (Section 11 of EA), in particular:
 - Revegetation and rehabilitation of waterways and banks disturbed during laying of pipelines;
 - Development of an irrigation strategy for the application of recycled water in the township including implementation of buffer zones;
 - Removal of weeds and revegetation with native species in the riparian zones within the Googong township site;
 - Implementation and maintenance of riparian buffer zones along drainage lines within the Googong township site;
 - Use of appropriate erosion and sedimentation controls during construction;

I&I NSW requests that all the above commitments and recommendations are made approval conditions for the development by Department of Planning.

Contact:

The contact person for matters relating to fisheries and aquatic habitat is Dr Trevor Daly, Fisheries Conservation Manager – South Coast, Ph 02) 4478 9103 or email: trevor.daly@industry.nsw.gov.au

Division of Primary Industries, Fisheries Conservation & Aquaculture
Port Stephens Fisheries Institute
Locked Bag 1, NELSON BAY NSW 2315
Tel: 02 4982-1232 Fax: 02 4982 1304
ABN 51 734 124 190 www.industry.nsw.gov.au

ATTACHMENT B – AGRICULTURE ISSUES

Water Cycle Projects are not a major issue in relation to agricultural land and use issues. Accordingly I&I NSW has not provided specific comments on this particular development application for the Googong Water Cycle Project.

The agricultural Land Use Planning Team within Industry & Investment NSW retains a strong interest in; strategic land use planning matters, agricultural land rezoning; intensive agricultural developments; and major projects likely to significantly impact on agricultural resources or agricultural industries (eg mining proposals).

In place of the advice we have previously provided on specific developments such as infrastructure proposals, we have produced a series of guidelines for use by consent authorities and consultants. These guidelines are available from the I&I NSW land use planning and development web portal: <http://www.dpi.nsw.gov.au/environment/landuse-planning/agriculture>. The series includes a specific guideline on [Infrastructure proposals on rural lands](#) which identifies the critical agricultural issues and recommended development planning and assessment responses. The document can also be used as a benchmark for assessing environmental assessment reports of such developments.

Contact:

The contact person for matters relating to agriculture is Wendy Goodburn, Resource Management Officer, Ph 02) 4828 6635 or email: wendy.goodburn@industry.nsw.gov.au.

Swati Sharma - Fwd: Exhibition of Environmental Assessment for Googong Water CycleProject (Major Project 08/0236)

#4

From: plan_comment
To: Swati Sharma
Date: 17/12/2010 1:28 PM
Subject: Fwd: Exhibition of Environmental Assessment for Googong Water CycleProject (Major Project 08/0236)
Attachments: Exhibition of Environmental Assessment for Googong Water CycleProject (Major Project 08/0236)

To whom it may concern,

I send these comments on behalf of Daniel Walters who received a letter from Lisa Mitchell on 10th November 2010 inviting a written submission on the above-mentioned Environmental Assessment:

Thankyou for the invitation to comment on the Environmental Assessment (EA) for the Googong Water Cycle Project. Environment Protection, Department of the Environment, Climate Change, Energy and Water has reviewed the EA. In general it appears to be a robust and thorough assessment of the potential environmental impacts of the proposal.

However, I would raise the following suggestions:

The EA states that the development will consider and avoid potential impacts on Pink-tailed Legless Lizard and Hoary Sunray habitat (page XV of Executive Summary). The Pink-tailed Legless Lizard is a declared species in the ACT, and the regional impacts on ACT populations should be considered. Any clearance of habitat should be avoided, and offset if damage can't be avoided. The development should include consideration of cumulative impacts on the species.

It is noted that older surveys has been used to determine vegetation data for the subject site. Resurveying the area now may provide different results as the vegetation may well be in better condition than previously, particularly if land use has changed.

Please contact Kathryn Tracey on 6207 5717 if you have any queries in relation to these suggestions.

Regards,

Cassie Schilg | EPA Liaison Officer

Environment Protection Authority
 Dept. of the Environment, Climate Change, Energy and Water
 ☎ P: 02 6207 6251 | 📠 F: 02 6207 6084 | ✉ E: cassie.schilg@act.gov.au

 This email, and any attachments, may be confidential and also privileged. If you are not the intended recipient, please notify the sender and delete all copies of this transmission along with any attachments immediately. You should not copy or use it for any purpose, nor disclose its contents to any other person.

Swati Sharma - Online Submission from Robert Burne of Environmental Scientist & Resident of Wickerslack lane, Googong (other)

From: Robert Burne <caburn@ozemail.com.au>
To: Swati Sharma <swati.sharma@planning.nsw.gov.au>
Date: 20/12/2010 9:19 AM
Subject: Online Submission from Robert Burne of Environmental Scientist & Resident of Wickerslack lane, Googong (other)
CC: <assessments@planning.nsw.gov.au>

#5

While generally supporting the proposed treatment system, I am concerned that same environmental implications have yet to be adequately assessed.

1. The project is intimately associated with the proposals for stormwater management and cannot really be assessed in isolation. greater attention should be given to the details of stormwater management as part of this proposal.
2. The geological and geomorphological assessments are simply literature reviews and no detailed surveys appear to have been done to identify special aspects that may have important implications for this proposal. This is especially true for the setting of Googong Creek, which is to be used as the discharge water-course.
3. Aquatic ecology assessment is extremely important to the impact of the discharges on the Queanbeyan River. No detailed monitoring of the river ecology appears to either have been undertaken and to be proposed for the future. Reference is made to the slightly degraded nature of the Queanbeyan River. This is likely due to the effects of the Googong Dam and the water management regime used for regulating discharge from the Dam. There is an urgent need to ensure that the discharge from Googong does not further degrade the Queanbeyan River Ecosystem, and also to ensure that the relative impacts of Googong Dam discharge and Googong Township discharge can be distinguished in the monitoring program.
4. There seems to be very little real data on surface and groundwater flows to underpin the hydrological modelling, which seems to be entirely computer based. Specifically there is no study of current discharges from Googong Creek, and the impacts of increased discharges through the Creek as a consequence of the Googong Township Development. Similarly the important groundwater/surface water interactions appear not to have been fully appreciated. One problem here is that the studies have been undertaken in a time of drought. The recent rains and flooding have underscored the importance of groundwater recharge and discharge from surface aquifers dominated by fracture porosity, and flash-flood regimes in both the creeks and the Queanbeyan River. These situations do not seem to have been adequately considered in the proposal.
5. Many residents of Wickerslack Lane both swim in the Queanbeyan River and use the River water for domestic water supply. It is essential that this development does not degrade the water quality of this reach of the Queanbeyan River. There is particular concern about the leakage of raw sewage into the river at times of high flow through the system.

Name: Robert Burne

Organisation: Environmental Scientist & Resident of Wickerslack lane, Googong

Address:

191 Wickerslack lane

Googong

NSW 2620

IP Address: 124-171-107-246.dyn.iinet.net.au - 124.171.107.246

Submission for Job: #3119 Project Application for Stage 1
https://majorprojects.onhiive.com/Index.pl?action=view__job&id=3119

Site: #1730 Googong Water Cycle Project
https://majorprojects.onhiive.com/Index.pl?action=view__site&id=1730

Swati Sharma

Environmental Planning Officer

P: 9228 6221

F: 9228 6355

E: swati.sharma@planning.nsw.gov.au

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Swati Sharma - Online Submission from Susan and Trevor GIBSON of Home owner at Wickerslack (object)

From: Susan and Trevor GIBSON <stnosbig@bigpond.net.au>
To: Swati Sharma <swati.sharma@planning.nsw.gov.au>
Date: 20/12/2010 9:20 AM
Subject: Online Submission from Susan and Trevor GIBSON of Home owner at Wickerslack (object)
CC: <assessments@planning.nsw.gov.au>



Googong Township Water Cycle Project Environment Assessment

Comments submitted by Susan and Trevor Gibson, 151 Wickerslack Lane, Googong, NSW. Dated 19/12.2010

40 Years using Queanbeyan River Water

We have lived beside the Queanbeyan River since 1968 and used the unfiltered river water for our household for over 40 years. We bathed ourselves (and our babies) in it, cleaned our teeth, washed our vegetables and dishes etc in the untreated river water. We pump the water directly onto our vegetable garden. We have used the river for recreation, swimming in it daily during the summer.

We have suffered no ill health from the use of the river water and it is interesting to see in this report (page 101 Table 7.2) that the 75th % and maximum faecal coliform count for Wickerslack were 8cfu/100ml Why only one reading? Where are the figures for a longer period of time? The E. coli count below Queanbeyan City at the ACT border 75th percentile was 365 and the maximum was 14,000 cfu/100mls. This was obviously due to the spillage from the Queanbeyan sewerage works. - (mismanagement??human error?-wrong phone call?).

Over this 40-year period we have seen the ecology of the river change due to eutrophication and decreased river flow and cessation of the minor spring floods. All this has occurred since the Googong dam was built in 1975. However the water released from the Googong dam has been clear and sweet and free of faecal and storm water contamination.

Lack of Data on Fauna and Flora within the River.

It is known that biodiversity and the presence of indicator species can be used to measure the health of a river. Where is the data for the Queanbeyan River in this report?

The current ecological state of the Queanbeyan River is described (page 165) as ?slightly to moderately impaired condition when all sites below Googong are considered.?

The results on Table 11.5 show that the ecological health of the river at Wickerslack in Autumn 2005 and 2006 was good. (Where are the results for 2003 and 2004?) The macro invertebrate composition (taxa richness) and abundance of specific macro invertebrates and genera was similar to the reference (model?s expectations for the habitat) and scored A on the AusRivas banding scheme.

The report states

?The details, such as composition of detected macro invertebrates? are provided in a series of Ecowise reports (Refer to appendix F)?.

These have not been published with this report in appendix F, even though it is stated that they are ?important for comparison in any monitoring of potential impacts.?

Tables 11.4 and 11.5 are not sufficient data on this aspect of river ecology. There appears to be no data published in this report as a base line. So how can the impact (or non impact) and effect on the life within the Queanbeyan River of the storm water and excess recycled water from the Googong development be assessed?

Monitoring Station at Junction Googong Creek and Queanbeyan River.

This is to be set up 12 months before the operation starts (see Section 7.3 page 103) but the development is

predicted to start in June 2011 and no station exists, and no data has been collected in the last 6 months. There seems to be no statement on what will be monitored and what data is to be collected. Is it only nitrate, phosphate levels, turbidity and conductivity that will be measured? Will the fauna and flora in the Googong Creek and adjacent Queanbeyan River also be monitored? Who will be collecting the data? And how often will it be collected and analysed? What action will result from the analysis of the data?

Spread of weeds downstream

The report indicates that the Googong and Montgomery Creek Valleys are full of weed species. The recycled water and storm water released from the Googong will increase the flow along these creeks and exacerbate the spread of weeds (see page 168 Section 11.2.4 of the report). It is stated that the weeds should be cleared before the development starts.

?Weeds need to be surveyed, mapped and managed by selective removal? Who is responsible for this? - the private landowner, Queanbeyan City Council or CIC? Will this really happen before the development starts? The creeks are on privately owned land and we doubt that the owner will remove the weeds.

Development by stages and funding.

CIC will be designing and building to cope with the first 500 households. During this period they say they will be monitoring carefully and will then build the next stage to cope with the ever-increasing population at Googong. The running of the plant will be under the control of Queanbeyan Council officers, but there is no clear indication how the hand over will occur and the future relationship between the design, building, funding and management of future stages.

Where is the guarantee that the Queanbeyan council will come up with the money to build the required capacity before it is needed? Has Council pledged to fund this project for the next 25 years regardless of cost? Can future councils rescind such a pledge?

Control of development and correct management of the Plant.

How will the Queanbeyan Council ensure that builders and drainers do not connect storm water to the sewerage system? Who will be responsible for maintaining the infra structure of this system so that it never breaks down and spills into the Queanbeyan river, even in the event of bushfire destroying pumping stations, extreme weather storms causing the holding tanks to overflow, earthquake tremors to fracture the infra structure, not to mention human error which has been responsible for sewage spills from Queanbeyan's existing sewerage works? Notoriously Councils find the money to react to an event or catastrophe, not to spend money to safeguard and prevent an event from happening.

Stormwater

We have concerns about the chemicals and pathogens in storm water and the recycled water (which will sometimes be discharged into the storm water) entering Googong Creek and the Queanbeyan River.

1. pesticides, fertilisers, nicotine and also chlorine for example
2. parasites from dog and cat faecal matter
3. human viruses and medications.

How will the Queanbeyan Council be monitored to prevent these pollutants from entering the waterways?

Pathogens in the recycled water.

This report states that pathogens, viruses, protozoa and bacteria will be removed from the recycled water. (See page 119(section 8.5.2.) The Table 8.2 shows log reduction requirements for pathogens in recycled water to be used for toilet flushing, washing machines and garden uses. Table 8.3 suggests that initially the processes may not reach the requirements for removal of viruses from the recycled water.

If we residents of Wickerslack continue to use the river water (as we have done so in the past 40 years) in our households, using it for bathing, cleaning our teeth, food preparation, washing dishes as well as clothes, we will definitely be exposed to human viruses from the recycled water being discharged into Googong Creek and the Queanbeyan River, even if it eventually reaches the levels required for recycled (not potable) water.

Storm Events.

This water sewerage and water recycling plant has been designed to cope with all wet weather events yet we have been told that all future weather patterns cannot be predicted because of climate change due to global warming. The storm patterns vary locally. The other night Googong Dam received 101mls of rain, Wickerslack 38mls in the same time period. What was received at the Queanbeyan Bowling Club? Their rain records were used to do the mathematical modelling and future predictions of storm events at Googong. How reliable is this model?

We are not satisfied that silt and pollutants will be effectively controlled from running off the building sites during development, and the urban area once it is built.

We believe increased erosion along Montgomery and Googong Creeks will also occur and large amounts of silt will be deposited into the Queanbeyan River.

Comments have been made that if more recycled water is released because of a storm event this (together with the storm water run off) would be diluted by water coming down the Queanbeyan River. This would only occur if the dam is 100% full and overflowing the spillway (a rare event which only happens once every 20 years).

Risk of Spills and Control of Storm Water.

Chemicals.

This development sets out methods of control of chemical spills of chemicals to be used in the water cycling plants. Who in the total life of this development will police that these chemicals are being stored correctly and that staff is being trained to handle these chemicals in any emergency that may arise during bush fires or severe storm events?

Sewage

The Queanbeyan City Council will be managing the new sewerage system and we have no faith in Council's management on past history, and do not believe there will never be a spill of chemicals, fuels or sewage into the Googong Creek and Queanbeyan River.

This development plan in the risk assessment table 6.4 (page 89) states that changes in the water quality during the operation phase would be possible with major consequence. This means it would probably occur at sometime and would cause medium to long-term potentially irreversible impacts. It states that failure of the treatment system and spill of pollutants will be rare and produce extreme consequences.

This means it would only occur in exceptional circumstances and cause long-term irreversible impacts.

It is essential that this recycling plant be over designed and built BEFORE the building development at each stage over the 25-year period. Aging infrastructure must be replaced before it breaks down because of old age. It must be CORRECTLY MANAGED forever and no mistakes made (human or otherwise). It is important to protect our Australian rivers for now and future generations, and an accidental spill MUST NEVER happen.

Health and Safety of Wickerslack Residents.

The Queanbeyan Council will not be able guarantee that in future there will (a) never be a chemical or sewage spill into the Queanbeyan River and
(b) the storm water run off from the development will not be degrading the river,
(c) the recycled water released from the development will not contaminate the Queanbeyan River with pathogens and possibly human medications.

Because the new Googong development will make the river water unsuitable for household and at times recreational use, we request that

- (i) the Queanbeyan City Council be required in the near future, at their expense, to reticulate potable water along Wickerslack Lane, and thus safeguard the health and safety of these Queanbeyan residents.
- (ii) the residents of Wickerslack be immediately informed if a spill occurs ?due to unforeseeable circumstances? so

they can cease to use the river for recreational purposes such as swimming and fishing.

Management plan of the Queanbeyan River Corridor

Finally we wish to draw your attention to Section 4 of the Management Plan of the Queanbeyan River Corridor published in 1999, and subsequently adopted by Queanbeyan City Council. (At this time Wickerslack was part of the Yarrowlumla Shire.)

It describes the section of river from the then City boundary into Yarrowlumla Shire to Googong Dam saying,
?The unit has limited impacts from urban development and contains the most natural areas of river below the dam.?

Now all management units along the Queanbeyan River Corridor will have to add to the list of threats the following,

- ?- Sedimentation from urban uses
- Storm water inflow, which lowers the water quality
- Sewage treatment works and the potential for overflow.?

Refer to section 4 that summarises in various tables the ?Values and Major issues of the Queanbeyan River Corridor.?

Under the section ?Water Quality and Environmental flows? it states.

?Clean water and ensuring flows in the river are able to sustain the diversity of wildlife are valued highly by the community because

- It is part of the natural environment and high quality is fundamental to the health of the environment
- It supports a healthy density and diversity of aquatic flora and fauna
- - It supports recreational activities and people would like to swim in it safely
- -People would like to be able to fish and eat their catch safely
- - It is attractive and forms a backdrop for the City and natural bushland.?

The following objectives to support the goal for water quality and environmental flows were recommended.

1. Ensure urban development does not adversely impact on water quality.
2. Adopt Best Practice environmental management measures.
3. Ensure regular management activities minimise adverse water quality impacts
4. Continue to improve water quality through improved catchment management at the catchment level including control point sources of urban run off.
5. Ensure environmental flows in the river provide sufficient quantity and quality to maintain aquatic life and river health.

We ask that the Queanbeyan Councils now, and in the future, will find the money and personnel and expertise to carry through the above objectives, manage the environment to protect the water quality of our Queanbeyan River for the present and future generations.

We ask the NSW Government to see that the Queanbeyan Council carries out the objectives of their management plan of the Queanbeyan corridor.

We ask this especially with reference to this new urban development of Googong.

Susan J Gibson and Trevor L Gibson
Queanbeyan Residents of Wickerslack Lane.

Name: Susan and Trevor GIBSON
Organisation: Home owner at Wickerslack

Address:
residential - 151, Wickerslack Lane, Googong, Queanbeyan NSW 2620
postal- PO Box 248. Queanbeyan NSW 2620

IP Address: cpe-121-223-197-110.lns3.civ.bigpond.net.au - 121.223.197.110

Submission for Job: #3119 Project Application for Stage 1
https://majorprojects.onhiive.com/index.pl?action=view_job&id=3119

Site: #1730 Googong Water Cycle Project
https://majorprojects.onhiive.com/index.pl?action=view_site&id=1730

Swati Sharma

Environmental Planning Officer

P: 9228 6221

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Swati Sharma - Online Submission from Des Allen of ActewAGL Distribution (support)

From: Des Allen <des.allen@actewagl.com.au>
To: Swati Sharma <swati.sharma@planning.nsw.gov.au>
Date: 20/12/2010 9:15 AM
Subject: Online Submission from Des Allen of ActewAGL Distribution (support)
CC: <assessments@planning.nsw.gov.au>

#7

Attached Letter outlines a clarification of the location of new connection to existing assets owned by ACTEW Corporation and operated by ActewAGL Distribution.

Name: Des Allen
Organisation: ActewAGL Distribution

Address:
12 Hoskins Street
MITCHELL ACT 2911

IP Address: mail1.actewagl.com.au - 202.14.247.4

Submission for Job: #3119 Project Application for Stage 1
https://majorprojects.onhiive.com/index.pl?action=view_job&id=3119

Site: #1730 Googong Water Cycle Project
https://majorprojects.onhiive.com/index.pl?action=view_site&id=1730

Swati Sharma
Environmental Planning Officer

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ActewAGL House 40 Bunda Street Canberra ACT 2600 ■ GPO Box 366 Canberra ACT 2601
Telephone 13 14 93 Facsimile 02 6249 7237 actewagl.com.au

#7

File Ref : G09/2481/1
Contact : Des Allen
Tel : 6242 1456
Email : des.allen@actewagl.com.au

17 December 2010

Director General
NSW Department of Planning
GPO Box 39
SYDNEY NSW 2001

Googong Water Cycle Project
Application Number: 08_0236

Dear Sir

We refer to the above application which is currently available for public consultation.

We have perused the document 'Googong Township – Environmental Assessment November 2010' submitted in support of the above application. This proposal includes the provision for potable water to be drawn from a large bulk supply main at the existing Googong water treatment plant. The existing main and treatment plant are owned by ACTEW Corporation. ActewAGL acts as agent for ACTEW Corporation in this matter.

In accordance with your requirements, ACTEW Corporation has advised that this company has not made any reportable political donations or gifts to NSW parties during the last two years.

Our comment is in the way of a clarification of the various drawings included with the abovementioned document that show the new bulk water pumping station located to the East of the ACTEW owned main and with its new delivery main passing through the site of the Googong water treatment plant, onto the new Googong estate. A new arrangement has now been agreed between ACTEW and the developer whereby the new pumping station will be located to the West of ACTEW's main, and the delivery main to the estate will pass completely outside the Googong water treatment plant. The developer's main will enter onto the Googong Dam road further to the West and closer to the proposed estate development.

Yours faithfully



Matt O'Rourke
Manager
Infrastructure Development and Asset Management Branch

Let's power ahead.



**Environment,
Climate Change
& Water**

#8

Your reference:
Our reference:
Contact:

S08/01819
DOC10/54855 FIL10/2655
Julian Thompson, 6992 7002

Ms Lisa Mitchell
Manager, Water Projects
Infrastructure Projects
Department of Planning
GPO Box 39
Sydney NSW 2001

21 December 2010

Dear Ms Mitchell,

**RE: Environmental Assessment - Proposed Googong Township Water Cycle Project – Part 3A
*Environmental Planning & Assessment Act 1979***

I refer to your letter dated 10 November 2010 regarding the Environmental Assessment (EA) for the proposed Googong Township Water Cycle Project.

The Department of Environment, Climate Change and Water (DECCW) has reviewed the EA and provides comments and recommendations for the Department of Planning's consideration. These comments and recommendations are in **Attachment 1** to this letter.

DECCW is happy to discuss these comments further with the Department of Planning and the proponent. If you have any queries about this matter, or wish to arrange a meeting, please contact me on (02) 6229 7002.

Yours sincerely,

JULIAN THOMPSON
Unit Head – South East Region
Environment Protection and Regulation Group

Attachment A

Googong Township - Water Cycle Project – Environmental Assessment

Department of Environment, Climate Change & Water (NSW) – Comments – December 2010

General

An Environment Protection Licence under the *Protection of the Environment Operations Act* 1997 is likely to be required for a Scheduled Activity (Sewage Treatment Systems) as the project approval for Neighbourhood 1A caters for up to 3,600 Equivalent Persons.

The Load Based Licensing scheme as set out in the *Protection of the Environment Operations Act* 1997 and Regulations will apply to all discharges (to irrigation and to waters) from the scheme. Fee discounts may apply in accordance with the Regulations for effluent which is beneficially reused.

DECCW generally supports the proposal to use modern sewage treatment technology to achieve good effluent quality and enable partial reuse of treated effluent in preference to discharge to waters.

Wastewater Treatment for Discharge to the Environment

The EA proposes that a membrane bioreactor plant (MBR) be used to treat wastewater from the township to a standard for a combination of non-potable re-use, irrigation and direct discharge to the environment into Googong Creek. Final disinfection (ultraviolet light and Chlorine dosing) would be undertaken for all treated effluent.

An emergency bypass system for the sewage treatment plant is also proposed which discharges to Montgomery Creek. The capacity of sewage treatment plant is 3.5 times average dry weather flows before discharge of primary treated sewage to Montgomery Creek. Each sewage pumping station is proposed to have a minimum of 4 hours of peak dry weather flow as emergency storage in the event of pump or power failure.

The MBR plant, water supply and sewerage system is proposed to be built in stages to accommodate growth of the township over the 25 year development horizon. Appropriate odour controls have been incorporated into the design of the plant and the sewerage infrastructure.

Project approval is sought in this application for Stage 1a – up to 1000 people, with sewage to be generally tankered away from sewage pumping station SPS 1, and Stage 1b – Two sewage pumping stations (SPS 1 and SPS 2) to be constructed.

In Table 5.8 of the EA the proponent sets out its proposed consent conditions for effluent quality. DECCW has reviewed these against its current expectations for modern sewage treatment systems and in light of the Water Quality Objectives assessment (ANZECC) provided in the EA. DECCW's recommendations for final effluent quality are slightly different to those suggested in the EA and are outlined below.

DECCW recommendations regarding final effluent quality

Parameter	DECCW Proposed discharge limits to Environment (90 th %)	Proponent's proposed limit (90 th %)
BOD	10 mg/L	10 mg/L
Suspended Solids	10 mg/L	20 mg/L
TN	10 mg/L	15 mg/L
TP	0.5mg/L	0.5 mg/L
TDS	700 mg/L	700 mg/L
Faecal Coliforms	200 cfu/100mL	No limit proposed
pH	6.5-8.5	No limit proposed
Free Chlorine (residual)	0.1 mg/L	No limit proposed
Nitrogen – Ammonia	2 mg/L	No limit proposed
Oil & Grease	2 mg/L	No limit proposed

DECCW would also propose to establish 100% concentration limits after sufficiently reliable performance data for the plant is available after commissioning. Loads limits would also be imposed for the sewage treatment plant in accordance with the Load Based Licensing protocol and the *Protection of the Environment Operations (General) Regulation 2009*.

Irrigation Water Quality

It is proposed to use recycled water (treated effluent) to contribute to the irrigation of public areas (eg parks and sporting fields). The EA has demonstrated that irrigation of treated effluent is not likely to impact on ground or surface waters or lead to a build up of nutrients in the soil. There is a small risk of a build up of salt loads in the soil. DECCW supports the development of a Recycled Water Risk Management Plan (draft statement of commitments HH2) which will expand on the analysis in the EA and provide guidance about detailed irrigation designs and nutrient, salt and hydraulic loads.

DECCW recommends that any such Risk Management Plan be drafted to comply with the requirements of the *Environmental Guidelines: Use of Effluent by Irrigation, DEC, 2004*.

Biodiversity

Sewage Pumping Station (SPS 2) is proposed to be located within 30 metres of a Pink-tailed Legless Lizard (*Aprasia parapulchella*) record and habitat. It is possible that this pump station could fail as it is designed to contain a minimum of four hours of peak dry weather flows of sewage. The pump station is located upslope of the known habitat of the Pink-tailed legless lizard.

DECCW is concerned that adverse impacts on the Pink-tailed Legless Lizard, and its habitat in that location, could be caused by overflows from the sewage pumping station. If overflows occur on a periodic basis (ie. during significant rainfall events) it is expected, over time, that the vegetation composition this species requires will be lost and replaced by nutrient loving weeds. To prevent any adverse impact on the Pink-tailed Legless Lizard habitat in the catchment around SPS 2, DECCW recommends that any potential for overflow of SPS 2 be eliminated. Measures to achieve this could include any combination of;

- Back-up pumps and uninterruptible power supply;
- Specifically design SPS 2 to contain a greater amount of sewage in the event of pump failure or power outages (eg. 24 hours average dry weather flows). This extended capacity could allow adequate time for back-up pumps or power sources to be sourced and installed;
- Physical measures to divert and capture any untreated sewage overflows from SPS2.

Aboriginal Cultural Heritage

The draft Statement of Commitments in the EA (at page 265) has two recommendations in relation to Aboriginal Cultural Heritage.

H1 - According to this commitment avoidance and mitigation of impacts to Indigenous sites will be done in accordance with DECCW guidelines and permits. As this development is being assessed under Part 3A of the EP&A Act there will be no requirement for any DECCW Aboriginal Heritage Impact Permits.

H2 – Effective implementation of this commitment would require a monitoring program conducted by archaeologists and Aboriginal people throughout the earthmoving and vegetation clearance phases of construction. The commitment should be amended to indicate this and to clarify the following:

- how unknown Indigenous heritage items (Aboriginal objects) will be located and identified during construction
- who will do this identification work
- whether all construction work will be monitored by qualified archaeologists and Aboriginal stakeholders

In the Aboriginal and Historical Archaeological Assessment (Navin Officer, Oct 2009), Appendix G to the EA, it is not clear whether Aboriginal site recording forms (or updated forms) for all of the previously recorded sites, newly recorded sites, excavated sites and collected surface sites been provided to DECCW. Provision of site cards is a legal requirement under the National Parks &

Wildlife Act that is not turned off by a Part 3A assessment process. The proponent should indicate whether this has been done and if not, provide this information to DECCW.

There are four Indigenous sites that have moderate to high, or high local significance (GA21, GA22 and GA 24, GA 26), see Appendix G, sec 8.1.2. The Statement Commitments in the EA does not specifically list or discuss these sites, nor does it recommended these sites be avoided and protected from any impact before, during and after development. DECCW recommends complete protection of the most significant sites within the development precinct. This should be included in the draft Statement of Commitments.

Noise Impacts

The EA indicates that noise levels from construction of water related infrastructure during stage 1 of the project is likely to exceed construction noise goals at nearby rural residences. The DECCW recommends the mitigation measures suggested in the EA be incorporated into any consent conditions for the project (eg. via a Construction Environmental Management Plan).

23 December 2010

SF090666
IC C10115638
OC C10115624

Manager – Water Projects
Infrastructure Projects
Department of Planning
GPO Box 39
SYDNEY NSW 2001

ATTN: Ms Swati Sharma

Dear Ms Sharam

RE: Googong Water Cycle Project (Major Project 08 0236)

In reference to your letter dated 10 November 2010 inviting comment on the subject proposal, consideration has been given to the issues associated with the ongoing ownership and operation of the water, sewer and recycled water system that is proposed for Googong.

Council would welcome the opportunity to discuss the proposal and the comments offered hereunder with Departmental representatives early in the new year, prior to the Department issuing its determination of the project.

Council is of the view that the current Water Supply Agreement and Service Level Agreement between Council and ACTEW exclusively applies to Queanbeyan City Council and does not provide for a third party to own or operate water supply facilities. Accordingly, Council requests that consideration be given to the inclusion of conditions of approval for the project that provide for the assets to be constructed to Council's water supply and sewerage standards and for the completed assets to be handed over to Council.

Council notes that the facilities will be constructed in stages and concurs with this arrangement. The Water Cycle Plan relies on assumptions made about the likely break up of water demand within the individual properties in the proposed township. These assumptions are used to justify the sizing of the proposed water, wastewater and recycled water assets that will be built to service the township. Council seeks conditions within the determination to ensure that the assumptions used in justifying the design of the assets proposed in the stage 1 release be demonstrated to councils satisfaction before they are adopted for the design of future stages. The initial testing and monitoring of the facilities to determine their compliance with the assumptions detailed in the project application should be undertaken at the developer's cost. Only once the system performance for each

stage has been verified should ongoing maintenance and monitoring become the responsibility of Council.


The attached Schedule 1 provides draft consent conditions that Council considers appropriate to be included in the project approval.

Council also notes that the bulk water pump station site is within Palerang LGA and therefore outside Council's jurisdiction. Nevertheless, proposed conditions of consent are also provided for this facility for consideration by the Department and Palerang Council in the attached Schedule 2.

If you have any further queries on the matter, please contact Council's City Infrastructure Group on 6285 6233.

Yours faithfully



 Phil Hansen
Group Manager
City Infrastructure

SCHEDULE 1

RECOMMENDED CONDITIONS

The following conditions are recommended for that part of the project application within QCC LGA –

GENERAL CONDITIONS

IN ACCORDANCE WITH THE PLANS

The development must be carried out generally in accordance with the application and supporting documents lodged with the Department of Planning and any amendments shown as notations in red or by conditions of consent.

REASON: To ensure the development is completed in accordance with the approved plans.

EPA LICENCE

Each project stage must satisfy the licence conditions issued by EPA for the project.

REASON: To ensure the development is completed in accordance with EPA licence conditions..

TREE PRESERVATION ORDER

The applicant must comply with Council's Tree Preservation Order at all times. All trees over 3m high or 3m wide are protected. Written consent of Council to remove, lop or prune any trees (unless specifically exempted) is required.

REASON: To draw the applicant's attention to the fact that Council's Tree Preservation Order applies to the land.

SECURITY FENCING & GATE

1.8 metre high security fencing and a 6.0 m wide security gate are to be provided around the water recycling plant compound and the water supply reservoir compound.

REASON: To provide security to the infrastructure.

MATERIALS AND STANDARDS

WATER SUPPLY SYSTEM

The drinking water and non-drinking water reservoirs shall be designed and constructed as pad mounted steel reservoirs. Stage 1b supply shall be via a booster pump or other arrangement suitable to Council rather than temporary elevated tanks.

The drinking water and non-drinking water rising mains shall be designed and constructed in accordance with WSA 03 – Water Supply Code of Australia (Version 2.3) and its supplement Dual Water Supply Systems (Version 1.2) and

Queanbeyan City Council's *Development Specification – Googong.*

- The drinking water and non-drinking water trunk reticulation mains shall be designed and constructed in accordance with WSA 03 – Water Supply Code of Australia (Version 2.3), its supplement Dual Water Supply Systems (Version 1.2) and Queanbeyan City Council's *Development Specification – Googong.* A minimum of four (4) District Metered Areas (DMA) are to be provided or both supplies for the ultimate development. Separate stand alone trunk mains shall be provided to service each DMA. Each trunk main shall have a flow meter (Magflow type), Pressure Regulating Valve, control function to regulate operating pressures and to be recorded via telemetry and Scada.

REASON: To provide an adequate water supply

SEWERAGE SYSTEM

The water recycling plant shall be constructed in stages in accordance with the *Googong Integrated Water Cycle Water and Wastewater Concept Design* prepared by MWH and dated 11 October 2010.

The water recycling plant office building shall be provided with the following amenities in Stage 1 ::

- Laundry with industrial washing machine and dryer.
- Laboratory with bench, basin and cupboards.
- Lunch facility with air conditioning and heating.
- Amenities with toilet, shower, change room and clothes cupboards.
- Control room with air conditioning, heating, benching, phone, PC, internet, telemetry controls etc.

The water recycling plant compound shall be provided with security lighting.

The sewerage pump stations and the sewer pressure rising mains shall be designed and constructed in accordance with WSA 04 – Sewerage Pumping Station Code of Australia (Version 2.1) and Queanbeyan City Council's *Development Specification – Googong.*

Sewerage pump stations shall be provided with

- A discharge flow meter (Magflow type) linked to telemetry and Scada.
- Continuous level monitoring via a submersible level transducer providing a 4-20mA output linked to telemetry and Scada.
- Permanent fully housed backup generator.
- Crane access around site.

REASON: To provide an adequate sewerage system..

PRIOR TO COMMENCEMENT

CC TO BE ISSUED BY AN ACCREDITED CERTIFIER

Building work in accordance with the development consent must not be commenced on site until a Construction Certificate (building) has been issued by Council or an Accredited Certifier.

REASON: To satisfy the relevant statutory requirements.

SUBMIT NOTICE OF COMMENCEMENT

A Notice to Commence Building Works must be submitted to Council two (2) days prior to commencing work and must include details of the nominated Principal Certifying Authority.

REASON: To ensure the provisions of the Environmental Planning and Assessment Act 1979 are satisfied.

NOTICE TO COMMENCE SUBDIVISION WORKS

Prior to the commencement of any subdivision works a Construction Certificate (subdivision) must be applied for and issued by Council. In order for Council to issue a Construction Certificate (subdivision) the application must be accompanied by:

1. a Traffic Control Plan that has been prepared in accordance with the requirements set out in Council's Information Sheet for Traffic Control and has been assessed by Council's City Infrastructure Division.
2. a Section 138 Certificate from Council's City Infrastructure Division providing consent under Section 138 of the Roads Act 1993 to conduct work or for placement of a structure in or on a road reserve.

A Notice to Commence Subdivision Works must be submitted to Council at least two (2) days prior to commencing work nominating Council as the Principal Certifying Authority.

REASON: To ensure the provisions of the Environmental Planning and Assessment Act 1979 are satisfied.

QCC AS PCA FOR SUBDIVISION

Queanbeyan City Council must be appointed as the Principal Certifying Authority for the subdivision works within Queanbeyan LGA, with such appointment to be made prior to the commencement of the subdivision application works. Please contact Council for a Notice to Commence Subdivision works form to complete to comply with this requirements. Alternatively the form is available from Council or downloadable from www.qcc.nsw.gov.au.

NOTE: A quotation for Council to perform the duties of Principal Certifying Authority for the subdivision works will be provided upon submission of the Construction Certificate (subdivision) to Council.

REASON: To provide for supervision of the subdivision works.

SIGN FOR BUILDING/SUBDIVISION WORKS

A sign must be erected in a prominent position on the work site prior to the commencement of works:

- a) stating that unauthorised entry to the work site is prohibited,
- a) showing the name of the person in charge of the work site, and
- b) advising telephone numbers at which that person may be contacted during work hours and outside work hours
- c) showing the name of the principal certifying authority and contact details.

The sign is to be removed when the work has been completed.

REASON: To provide notification of the work site and site supervisor to the general public in emergency situations.

TOILET FACILITIES

Toilet facilities must be provided at or in the vicinity of the work site at the rate of one toilet for every 20 persons or part of 20 persons employed at the work site.

Each toilet provided:

- a) must be a standard flushing toilet, and
- a) must be connected:
 - (i) to a public sewer, or
 - (ii) if connection to a public sewer is not practicable, to an accredited sewage treatment facility approved by Council, or
 - (iii) if connection to a public sewer or an accredited sewage management facility is not practicable, to some other sewage management facility approved by Council.

The provision of toilet facilities in accordance with this clause must be completed prior to commencement of any work on the site.

REASON: To provide adequate and hygienic amenities for people working on the site.

CONSTRUCTION MANAGEMENT PLAN

Prior to release of any Construction Certificate a Construction Management Plan must be submitted to Council and approved by Principal Certifying Authority for the proposed construction works or, if the proposed works are staged, for each stage of the proposed construction works. The plan must:

- a) describe the proposed construction works;
- b) outline the proposed construction program;
- c) set standards and performance criteria for each of the relevant environmental issues [see (f) below];
- d) describe what actions and measures would be implemented to ensure that these works comply with the specified standards and performance measures;
- e) describe how the effectiveness of these actions and measures would be

- monitored during the proposed works;
- f) include a detailed:
- Soil and Water Management Plan, prepared in accordance with Development Control Plan No. 41 – Soil, Water and Vegetation Management Plans;
 - Waste Management Plan;
 - Noise Management Plan;
 - Dust Management Plan;
 - Traffic Management Plan prepared in accordance with the requirements of Council's Engineering and Recreational Services Division;
 - Pedestrian Safety Plan;
 - Environmental Management Plan;
- g) describe what procedures would be implemented to receive, register, report and respond to any complaints during the construction works; and
- h) identify the key personnel who would be involved in the construction works, and provide contact numbers for this personnel.

The submitted Construction Management Plan may also require:

- a. A Traffic Control Plan that has been prepared in accordance with the requirements set out in Council's Information Sheet for Traffic Control and has been assessed by Council's City Infrastructure Division.
- b. A Section 138 Certificate from Council's Engineering and Recreational Services providing consent under Section 138 of the Roads Act 1993 to conduct work or for placement of a structure in a road reserve.

REASON: To ensure satisfactory environmental management of the site.

WASTE MANAGEMENT PLAN

The Waste Management Plan (WMP) must be submitted to Principal Certifying Authority for approval prior to issue of any Construction Certificate. Details of waste management on the site must be provided. A Waste Management Plan (WMP) must be completed to identify the type of waste that will be generated by the development and method of disposal to be utilised. The Applicant should consider whether it is possible to re-use materials either on-site or off-site.

REASON: To ensure satisfactory environmental management of the site.

ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) for the development must be submitted to and approved by the Principal Certifying Authority prior to release of the Construction Certificate. The EMP must be prepared in accordance with these conditions of approval, all relevant Acts and Regulations and accepted best management practices.

Details of the EMP must include an Environmental Controls Map (ECM) of the site and information on sub-plans including:

- Waste Management Plan;

- Noise Management Plan;
- Dust Management Plan;
- Noise and Vibration Management Plan;
- Water and Soil Management Plan;
- Traffic Management Plan; and
- Hazard and Risk Management Plan.

The EMP must provide the following information:

1. describe the proposed operations on the subject land;
2. identify all the relevant statutory requirements that apply to these operations
3. describe what measures and procedures would be implemented to receive, register, report and respond to any complaints during these operations; and
4. describe the role, responsibility authority and accountability of all key personnel involved in these operations

The development must comply with all the provisions of the above Environmental Management Plan.

REASON: To ensure satisfactory environmental management of the site.

COMPLIANCE CERTIFICATE-WATER & SEWER

Submission of an application for a Compliance Certificate under Section 307 of the Water Management Act 2000 to the Water and Sewer Authority (Queanbeyan City Council) accompanied by the relevant fee and four copies of the Civil Engineering plans for the design of the water reticulation and sewerage systems, drawn in accordance with Council's *Development Specification - Googong*, for assessment and approval by Council.

Upon approval of the hydraulic design a Compliance Certificate in accordance with section 307 of the Water Management Act 2000, will be issued by Council. The Compliance Certificate must be obtained prior to release of any Construction Certificate.

REASON: To ensure that hydraulic design is in accordance with Council standards.

ACOUSTIC REPORT PRIOR TO CC

An acoustic report prepared by a qualified acoustic consultant, must be undertaken to determine that noise levels generated by the proposed development will not exceed the levels specified in the New South Wales Industrial Noise Policy 2000. This report must be submitted to and approved by Council prior to issue of the Construction Certificate (Building).

REASON: To ensure noise levels from the development are not excessive.

SITE MANAGEMENT

INSTALL EROSION CONTROL AS PER APPROVED PLAN

Run-off and erosion and sediment controls must be installed onsite to prevent soil erosion, water pollution or the discharge of loose sediment on surrounding land by:-

- (a) diverting uncontaminated run-off around cleared or disturbed areas;
- (b) erecting a silt fence in accordance with the requirements of Council's DCP No 41 - Soil, Water and Vegetation Management Plans;
- (c) preventing tracking of sediment by vehicles onto roads;
- (d) stockpiling topsoil, excavated material, construction and landscaping supplies and debris within the site;
- (e) where any material is stockpiled onsite erosion control and siltation fencing must be installed adjacent to the toe of the mound;
- (f) removal or disturbance of vegetation and top soil is confined to within 3m of the approved building area; and
- (g) the erosion and sediment control measures must be maintained in a good order until the excess excavation materials have been removed from the site.

REASON: To prevent soil erosion and water pollution.

BATTERS TO HAVE CATCH DRAINS

Catch drains or agricultural drains must be provided on the top side of all batters to protect them from erosion.

REASON: To reduce the possibility of scouring to the landscape.

HOURS OF OPERATION FOR CONSTRUCTION

Any works associated with the construction and/or establishment of this development must **ONLY** be carried out between the following hours:

Weekdays:	7.00am to 6.00pm
Weekends/Public Holidays	8.00am to 4.00pm

Note: To undertake works involving the use of equipment which creates an offensive noise is a breach of the provisions of the Protection of the Environment Operations Act 1997 and Regulations thereunder.

REASON: To ensure a noise problem does not result from the development and the impact on the local amenity is minimised.

NO BURNING ON SITE

Waste material must not be burned on site.

REASON: To prevent creating a nuisance to adjoining properties.

DAMAGE TO BE APPLICANTS EXPENSE

In the event of any damage being caused to any existing road, kerb, guttering, stormwater pit, footpath trees and/or footpath during building operation, the applicant must repair or reimburse Council for the full cost of restoration.

REASON: To prevent damage to Council's public footway area and require payment to Council where damage occurs.

FENCING OF BUILDING WORKS

Fencing between building works and Council land (other than a roadway) must be erected before commencement of any other work on site.

REASON: To ensure adequate provision is made for protection of public property.

CUT & FILL MAXIMUM 1.5M

The maximum depth of any cut or fill must not exceed 1.5 metres.

REASON: To ensure dwellings are designed and sited to suit landform.

EXCAVATION MATERIAL TO BE REMOVED & DISPOSED

All excess excavation material must be removed from the site and disposed of at an approved landfill site.

REASON: To ensure the proper disposal of waste materials.

CAR PARKING

DRIVEWAY APPLICATION FORM

A driveway application form must be submitted to and approved by Council prior to commencement of driveway works and construction of the driveway across Council's footway area must be undertaken by Council or contractors approved by Council, at no cost to the Council.

REASON: To ensure the construction of the driveway on public land meets Council's requirements.

DRIVEWAY ENTRANCES

Driveway entrances must be constructed to all lots to the standard as specified in Council's Specification for the Construction of Access Roads and Private Entrances. These entrances must be located to give Safe Intersection Sight Distance in keeping with the design speed of the road along which they are sited. Access gates must be a minimum of 3.5 metres wide. Access onto Old Cooma Road must be in accordance with the requirements of the RTA *Road Design Guide* and will require the concurrence of the RTA under Section 138 of the Roads Act 1993. Access onto the section of Googong Dam Road within Queanbeyan LGA must be in accordance with the requirements of Council's

Development Specification – Googong for a Type A rural property access

REASON: To ensure safe entry and exit to lots from the road.

RURAL - INTERNAL DRIVEWAY CONSTRUCTION

The internal driveway and turning bay areas for the water recycling plant and reservoir sites must at least be constructed with a minimum bitumen sealed width of 3.0m on a 5.0 m formation and minimum compacted gravel thickness of 100mm. The design must provide for heavy vehicles such as cranes and provide sufficient area to turn a rigid truck.

REASON: To ensure that adequate access is available to the building for service vehicles.

SERVICE VEHICLE PARKING

The development must be provided with bitumen sealed service vehicle parking spaces and turning bay areas of dimensions complying with the requirements of Council's Development Control Plan No 1 *Carparking Policy* and as follows -.

- Water recycling plant – carparking for 2 work vehicles and 2 visitor vehicles. And site access for cranes and chemical deliveries to all areas.
- Reservoirs – spaces must accommodate a mobile crane and large rigid truck
- Bulk water pump station - spaces must accommodate a mobile crane and large rigid truck

REASON: To provide adequate offstreet service vehicle parking.

LANDSCAPING

DISTURBED AREAS TO BE TREATED

All disturbed areas must be established with grass seeded hydro mulching, turfing or other approved surface treatments.

REASON: To limit the impact of development and provide an attractive urban landscape.

MAXIMUM CUT & FILL BATTERS

Maximum slope of cut and fill batters must be 1 in 4 (25%) unless rock faced. Landscaped slopes steeper than 1 in 4 must have retaining walls.

REASON: To reduce soil erosion, provide stability to excavated area and to allow for future maintenance.

TREES RETENTION

Trees over three (3) metres high, located more than three (3) metres from the external wall of the building, or where there is no external wall three (3) metres from the outside edge of the eave line must be retained on site in accordance with Council's Tree Preservation Order.

REASON: To ensure compliance with Council's Tree Preservation Order and Local Environmental Plan provisions.

BUILDING

COMPLIANCE WITH BCA

All building work must be carried out in accordance with the provisions of the *Building Code of Australia*.

REASON: To ensure all building work is carried out in accordance with legislative requirements.

EXCAVATION AND BACKFILLING

All excavations, backfilling and other activities associated with the erection or demolition of a building must be executed safely and in accordance with appropriate professional standards.

REASON: To ensure that all construction activity associated with the development does not pose a hazard to life or property.

RETAINING WALL OVER 1 METRE HIGH

Retaining walls in excess of one (1) metre high must be designed and certified by a practising structural engineer.

REASON: To ensure that excavated or filled areas are supported by structurally sound walls.

SOIL CONDITIONS REQUIRE RETAINING WALL

If the soil conditions require it:

- (a) retaining walls associated with the erection or demolition of a building or other approved methods of preventing movement of the soil must be provided; and**
- (b) adequate provision must be made for drainage.**

REASON: To ensure excavation work is safely and professionally retained to prevent hazards to life or property.

WASTE CONTAINERS NOT ON ROAD

Receptacles for demolition material must not be located in a public place without the prior approval of Council.

REASON: To ensure that public places and road reserves are not obstructed during demolition works.

SURVEY BY SURVEYOR

The building must be set out by a Registered Surveyor referring to the datum shown on the approved plans. A survey plan that identifies the location of the building in relation to the building envelope must be prepared upon completion of the base course brickwork and then be submitted to the Principal Certifying Authority (PCA). Where Council is not the PCA, a copy of the survey plans must be forwarded to Council.

REASON: To ensure the building has been sited in accordance with the approved plans.

ENVIRONMENTAL

NO INTERFERENCE WITH AMENITY

The applicant must implement all practical measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

REASON: To prevent nuisance to neighbours and adjoining property.

NOISE LEVEL NOT TO EXCEED 5DBA ABOVE BACKGROUND

The applicant must ensure that noise generated by the development does not exceed the criteria set by the New South Wales Department of Environment Conservation and Climate Change (DECC). This is generally a level of 5dB above background noise level.

This is measured by monitoring the level of noise from any activity within the development represent by the L_{aeq} descriptor, measured over a 15 minute period. This measurement must not exceed the background level at that time of day by more than 5dB.

REASON: To minimise the impact of noise generated by the development on surrounding residential areas.

HAZARDOUS & TOXIC MATERIALS STORAGE

To ensure hazardous and toxic materials are not a threat to the environment they must be stored in accordance with WorkCover Authority requirements.

All tanks, drums and containers of toxic and hazardous materials must be stored in a bunded and covered area. The bund walls and floor must be constructed of impervious materials and must be of sufficient size to contain 110% of the volume of the largest tank plus the volume displaced by any additional tanks within the bunded area.

REASON: To minimise threat to the environment from hazardous and toxic materials.

FLAMMABLE LIQUIDS STORAGE & HANDLING

The storage and handling of flammable and combustible liquids must be in accordance with Australian Standard AS 1940 "The Storage and Handling of Flammable and Combustible Liquids" and New South Wales WorkCover Code of Practice for Storage and Handling of Dangerous Goods..

REASON: To satisfy relevant environmental standards.

REMOVAL OF CONTAMINATED MATERIALS FROM SITE

Any soil or other material located on site, which is found to be contaminated, is not to be removed from the site until Council has received evidence from a suitably qualified environmental consultant validating that levels of contaminants in the soils are below the threshold required for the proposed disposal method.

Contaminated soils/materials must be contained on site to ensure it is not disposed of into the stormwater or sewer systems.

REASON: To ensure that any contaminated materials are disposed of properly.

REMOVAL OF CONTAMINATED WATER FROM SITE

Any surface of subsurface waters found to be contaminated on the site are not permitted to leave the site without being treated to reduce contaminated levels to below the threshold for disposal to sewer or stormwater as appropriate.

REASON: To ensure contaminated waters are managed on site before disposal.

CONTAMINATION BY WIND BORNE DEBRIS

The whole site must be kept in a clean and tidy manner at all times with provision made on site for the containment of all material that could become windborne.

Demolition materials, excavated materials and the like must be kept clear of stormwater and sewer manholes and any service easements on the premises.

REASON: To prevent contamination of the surrounding area by wind borne debris and contamination of the stormwater system by sediment.

ASBESTOS REMOVAL AND DISPOSAL

Any asbestos cement material found on the site must be removed and disposed of in accordance with the Occupational Health and Safety Act 2000, as amended, and the NSW WorkCover guidelines.

Asbestos material must be disposed of to a landfill site approved for that purpose by the Environmental Protection Authority of New South Wales or equivalent authority in the Australian Capital Territory. Written evidence that the material has been disposed of to the approved landfill must be submitted to Council.

The applicant is advised that asbestos is a hazardous material/waste and as such special requirements relate to the documentation and licensing relating to

transport. If the material is proposed to be disposed of within the Australian Capital Territory, the applicant should contact Environment ACT and the ACT Landfill section prior to utilising these facilities.

REASON: To ensure the proper disposal of hazardous asbestos material.

PLANT AND EQUIPMENT NOISE

The noise level emanating from plant and equipment installed on the premises must not exceed a level of 5dB(A) above background level when measured for a LA_{eq} 15 minute period during the day, evening or night.

REASON: To reduce the noise nuisance to neighbours and to ensure that the requirements of the Protection of the Environment Operations Act 1997 and Regulations are satisfied.

ACOUSTIC REPORT

Within six (6) months of this consent, the Applicant must submit (and following approval implement) an acoustic report prepared by a suitably qualified, experienced and independent person, that assesses all noise sources on the development and sound attenuation work require to meet New South Wales Department of Environment and Climate Change Guidelines. The report must:

- a) Include an assessment of the level of noise generated from all noise sources and cumulative noise sources on the site;
- b) Set noise goals for sensitive noise receptors;
- c) Identifies all reasonable and feasible measures that could be implemented on the site to reduce the noise impacts on the business;
- d) Assess the likely effectiveness of these measures; and
- e) Describes what measures would be implemented to achieve these noise goals.

REASON: To ensure noise levels generated from activities on the site are not excessive and do not impact on surrounding sensitive receptors.

WASTE MANAGEMENT COMPLIANCE WITH PLAN

During the development the applicant must implement the range of waste management activities as specified in the approved Waste Management Plan.

REASON: To ensure that waste materials generated on the site are managed in an environmentally acceptable and sustainable manner.

PLUMBING AND DRAINAGE

LG WATER, SEWER & DRAINAGE REGS 1993, AS 3500 ETC

The reservoir sites and the recycled water treatment facility must be provided with a drinking water supply and a non-drinking water supply and the water recycling plant must also be provided with sanitary facilities. Such work must be carried out in accordance with the requirements of the Local Government (General) Regulations 2005, AS 3500 Plumbing and Drainage Code and the New South Wales Code of Practice – Plumbing and Drainage, with such works performed by a person licensed by the NSW Department of Fair Trading.

REASON: To ensure compliance with the Local Government (General) Regulation 2005.

INSPECTIONS OF PLUMBING & DRAINAGE

Plumbing and Drainage must be inspected by Queanbeyan City Council at the relevant stages of construction in accordance with Council's inspection schedule.

REASON: To ensure compliance with AS 3500 Plumbing and Drainage and Council's inspection schedule.

PROVISION OF A WATER METER

Provision of 20 mm water meters (drinking and non-drinking) at no cost to the Council to the reservoir sites and the recycled water treatment facility.

REASON: To provide an adequate metered water supply

SUBMIT WORKS AS EXECUTED PLAN

Works as executed plans of all sanitary drainage shall be submitted to Queanbeyan City Council prior to the issue of an Occupation Certificate.

REASON: To ensure that accurate records of sanitary drainage installations are available for future use by interested persons.

TITLE RESTRICTIONS

EASEMENTS AND RESTRICTIONS

Pursuant to Section 88B of the Conveyancing Act easements and restrictions as to use shall be created to achieve the following purposes:

- (a) all requisite sewerage easements;
- (b) all easements specified below and contained in the subdivision must benefit Council as well as particular lots.
 - easements to drain water,
 - easements to drain sewer,
 - easements for water supply

- easements which Council may require to provide access to maintain the constructed services.

REASON: To ensure public utility services, access and restrictions are legalised over the land.

DEDICATION TO COUNCIL

Dedication to Council, free of cost on the subdivision survey plans, the water recycling plant site, the sewerage pump station sites, the bulk water pump station site and the water reservoir sites.

REASON: To permit Council to adequately manage utility services.

SAFER BY DESIGN

STREET NUMBERING

The water recycling plant is to be clearly identified by a street number at its entrance to Googong Dam Road. The water reservoir site is to be clearly identified by a street number at its entrance to Old Cooma Road. Street numbers are to comply with Council's rural addressing policy and should be made of a durable material, be at least 7cm in height and positioned at a height between 0.6m-1.5m above ground level on the site boundary that fronts the street.

REASON: To ensure that buildings are clearly identified by street number to allow people and services (especially emergency services) to find the building easily.

CERTIFICATION OF WORKS

INSPECTIONS WATER & SEWER AUTHORITY

Inspections must be performed by the Water and Sewer Authority (Queanbeyan City Council) when water main and sewer rising main works reach the following stages:

- immediately prior to connection of new sewer pipes to the existing sewerage system,
- immediately prior to connection of new water pipes to the existing water reticulation, and
- immediately prior to the backfilling of sewer drainage trenches.

Council's City Infrastructure Division must be given 24 hours notice of the need for these inspections.

NOTE: Any inspections carried out by Council do not imply Council approval or acceptance of the works, and do not relieve the Developer from the requirements to provide an Engineering Construction Certificate Report in accordance with Council's *Development Specification - Googong*.

REASON: To ensure that hydraulic services are constructed in accordance with Council requirements.

CERTIFICATE OF COMPLETION

Certification of the completed water reticulation and sewerage system works and works as executed documentation must be included in an Engineering Construction Certification Report and submitted to Council in accordance with Council's *Development Specification - Googong*

REASON: To ensure that hydraulic services are constructed in accordance with Council requirements.

WORK IN ACCORDANCE WITH COUNCIL'S SPECIFICATIONS

All construction and restoration work must be carried out strictly in accordance with the approved drawings and Council's *Development Specification - Googong*.

REASON: To ensure construction and restoration work is in accordance with Council's requirements.

PUBLIC FACILITIES

The Developer will be responsible for all public utilities and services in the area of work and as such must notify all relevant Authorities and bear all costs associated with any repairs and/or adjustments as those Authorities deem necessary.

REASON: To ensure compliance with Utility Authorities' requirements.

PROTECTION OF WORK & SAFETY OF COMMUNITY

Lighting, fencing, traffic control advanced warning signs must be provided for the protection of works and for the safety and convenience of the public, in accordance with Council's *Development Specification - Googong*. Traffic movement in both directions on public roads and vehicular access to private properties must be maintained at all times, during the currency of the works for each project stage.

REASON: To ensure an adequate level of public safety and convenience during construction.

MONITORING

For the components identified in the *Googong Integrated Water Cycle Water and Wastewater Concept Design* prepared by MWH and dated 11 October 2010 that require monitoring to confirm compliance with the design assumptions, the developer shall undertake all such monitoring at his own expense and submit a report to Council for acceptance. In the event that test results indicate that modifications need to be undertaken to allow the stage to function in accordance with the EPA licence, the developer shall undertake rectification works prior to acceptance by Council. Upon acceptance of the works Council shall issue a Final Compliance Certificate under Section 307 of the Water Management Act 2000.

REASON: To ensure compliance with the approved project and the Utility Authorities' requirements.

MAINTENANCE

The Developer shall maintain each stage of the completed works at his own expense, for a period of twelve (12) months after the date of the issue of the Final Compliance Certificate by Council.

The developer must lodge a cash bond with regard to such maintenance in an amount as calculated from fees set by Councils Management Plan and current at the time of issue of the Subdivision Certificate.

In that period the applicant will be liable for any part of the work which it fails to perform in the manner outlined in the Council's *Development Specification - Googong* (or as would reasonably be expected under the design conditions).

The developer must provide Council with written authorisation, that in the event of any maintenance work not being completed to the standards specified in Council's *Development Specification - Googong* within the period specified, to enter upon the subject land and undertake such maintenance work and to deduct the cost thereof from such Bond monies held by Council and to refund the balance, if any, to the developer.

REASON: To ensure works are completed in accordance with Council's requirements.

OCCUPATION CERTIFICATE

OCCUPATION CERTIFICATE - PCA

An Occupation Certificate must be obtained from a Principal Certifying Authority before occupation or use of the building. The final Occupation Certificate will not be issued until the development has been completed in accordance with this consent.

REASON: To comply with Section 109M of the Environmental Planning and Assessment Act 1979.

COPY OF OCCUPATION CERTIFICATE WITHIN 2 DAYS

The Principal Certifying Authority must provide a copy of the Occupation Certificate to Council within two (2) days of the Certificate being determined.

REASON: To comply with clause 151(2) of the Environmental Planning and Assessment Regulation 2000.

LANDSCAPING COMPLETED

The landscaping of the site shall be completed prior to occupation or use of the premises in accordance with the approved plan, and be maintained at all times to Council's satisfaction.

REASON: To ensure adequate landscaping is maintained.

COMPLIANCE CERTIFICATE WATER & SEWER

An Occupation Certificate for any part of the development shall not be issued until a certificate of compliance in accordance with Section 307 of the Water Management Act 2000 is obtained from the Water and Sewer Authority (Queanbeyan City Council).

REASON: To ensure the development is adequately serviced prior to its occupation.

ENVIRONMENTAL RISKS

VEHICLE ACCESS

Temporary vehicle access to the site must be stabilised to prevent the tracking of sediment onto the roads and footpath. Soil, earth, mud or similar materials must be removed from the roadway by sweeping, shovelling, or a means other than washing, on a daily basis or as required. Soil washings from wheels must be collected and disposed of in a manner that does not pollute waters.

REASON: To minimise transfer of soil from the site onto the road pavement.

EXCAVATION PUMP OUT WATER

All excavation pump-out water must also be analysed for suspended solid concentrations, pH and any contaminants of concern identified during the preliminary or detailed site investigation, prior to discharge to the stormwater system. The analytical results must comply with relevant EPA and ANZECC standards for water quality.

REASON: To satisfy relevant environmental standards.

TRANSPORT

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site must be selected to meet the following objectives:

- comply with all road traffic rules;
- minimise noise, vibration and odour to adjacent premises; and
- utilise State Roads and minimise use of local roads.

Applicants may consult Council prior to selecting the most suitable transport route.

Category 2 remediation work must ensure that all site vehicles:

- conduct deliveries of soil, materials, equipment or machinery during the hours specified in the remediation action plan;
- securely cover all loads to prevent any dust or odour emissions during transportation;
- exit the site in a forward direction; and
- do not track soil, mud or sediment onto the road.

REASON: To ensure safe traffic management and transport of materials, machinery and so on.

IMPORTATION OF FILL

All fill imported on to the site must be validated to ensure the imported fill is suitable for the proposed land use from a contamination perspective. Fill imported on to the site must also be compatible with the existing soil characteristic for site drainage purposes.

Council may require details of appropriate validation of imported fill material to be submitted with any application for future development of the site. Hence all fill imported onto the site should be validated by either one or both of the following methods during remediation works:

- Imported fill should be accompanied by documentation from the supplier which certifies that the material is not contaminated based upon analyses of the material or the known past history of the site where the material is obtained; and/or
- Sampling and analysis of the fill material should be conducted in accordance with the EPA Sampling Design Guidelines (1995) to ensure that the material is not contaminated.

REASON: To ensure fill material is within acceptable standards.

SUBDIVISION CERTIFICATE

FINAL SURVEY - 6 COPIES

An application to obtain a Subdivision Certificate from Council must be made to Council.

In addition the application must be supported with the following documentation:

- A final survey plan of subdivision and six copies including an electronic copy in the format of digital vector to the projection of MGA (GDA 94) with boundaries and other line work to be insitu to projection. This should be accompanied with an application for a subdivision certificate to be submitted to Council. Where approved drawings provide survey coordinates of structures, the final survey plan should include a schedule of the set out centreline coordinates of all listed structures as constructed in accordance with approved plans. The schedule should include type of

structure, finished cover & invert levels of structures.

REASON: To ensure works are completed in accordance with the requirements of the Council, statutory bodies and the true location of assets supplied are appropriately coordinated and documented and to comply with Section 109 Environmental Planning and Assessment Act 1979.

STATEMENT FROM SURVEYOR

Submission to the Principal Certifying Authority of a statement prepared by a registered surveyor, stating that all water and sewer pipelines are completely located within their easements.

The statement must be submitted upon completion of the subdivision works and prior to the issue of the Subdivision Certificate.

REASON: To ensure works are completed in accordance with Council's requirements.

WATER & SEWER COMPLIANCE CERTIFICATE

A certificate of compliance in accordance with the Water Management Act 2000 is to be obtained prior to the issue of a Subdivision Certificate.

REASON: To ensure compliance with the statutory requirements of the Environmental Planning and Assessment Amendment Act 1979.

SUBMISSION FROM SERVICE AUTHORITY

Written evidence from the relevant service authority or a suitably certified or accredited person that satisfactory arrangements have been made for the supply of reticulated electricity and telephone services to each lot shall be submitted to Council.

REASON: To satisfy relevant utility authority requirements.

COMPLIANCE WITH CONDITIONS

Conditions of this development consent must be complied with prior to your final subdivision plan being signed and released by Council to enable you to register your plan with the office of Land and Property Information. In this regard you will need to provide written evidence to Council by way of a letter outlining compliance with each condition including payment of any Council bonds and certificates from Country Energy and Telstra that their requirements have been satisfied.

REASON: To ensure the development is completed in accordance with Council's conditions of consent prior to release of the subdivision certificate.

SCHEDULE 2

PROPOSED CONDITIONS

The following conditions are recommended for that part of the project application within Palerang LGA

MATERIALS AND STANDARDS

WATER SUPPLY SYSTEM

The bulk water supply pump station shall be designed and constructed to the requirements of ACTEW-AGL and must provide for supply from Googong or Stromlo water treatment plants.

REASON: To provide an adequate water supply

CAR PARKING

SERVICE VEHICLE PARKING

- The bulk water supply pump station must be provided with a bitumen sealed access road and service vehicle parking space and turning bay areas of dimensions that accommodate a mobile crane and large rigid truck

REASON: To provide adequate offstreet service vehicle parking.

PLUMBING AND DRAINAGE

PROVISION OF A WATER SUPPLY

Provision of a drinking water supply at no cost to the Council to the bulk water supply pump station.

REASON: To provide an adequate water supply.

SITE FACILITIES

SITE FACILITIES

The bulk water supply pump station shall be provided with the following:

- 1.8m high security fencing
- suitable pump and facility protection from the environment
- telemetry
- suitable site security lighting

REASON: To provide adequate site facilities



Office of Water

#10

6 January 2011

Lisa Mitchell
Major Development Assessments
Department of Planning
GPO Box 39
SYDNEY NSW 2001

c: Tim Baker
t: 02 6841 7403
f: 02 6884 0096
e: Tim.Baker@water.nsw.gov.au

Our ref : ER20439
Your ref:

Attention: Swati Sharma

Dear Swati

EXHIBITION OF ENVIRONMENTAL ASSESSMENT – GOOGONG WATER CYCLE PROJECT (MP08_0236)

I refer to your letter dated 10 November 2010 requesting a review of the exhibited environmental assessment (EA) for the Googong Water Cycle Project. The NSW Office of Water (the Office) appreciates the opportunity to comment and has identified the requirement for additional information to assist in a comprehensive assessment of the project. The key matters requiring additional information include the following with further detail provided in Attachment 1:

- Inadequate assessment of the ecological impacts of flow modifications to Googong Creek and the Queanbeyan River.
- Identification and assessment of impacts of flow modifications to water users within Googong Creek and/or the Queanbeyan River.

Should further information be required in relation to this submission please do not hesitate to contact Tim Baker on (02) 6841 7403.

Yours sincerely

Mark Mignanelli
Manager Major Projects and Assessment

ATTACHMENT 1 – NOW DETAILED COMMENTS

ECOLOGICAL ASSESSMENT

Googong Creek

- Section 11.2 of Volume 1 of the environmental assessment indicates no aquatic values can be assessed in Googong Creek. The Office does not consider this statement to be adequately supported and requests the following:
 - Assessment of the existing ecological value of Googong Creek and its supporting riparian zone within the project site and downstream to the confluence with the Queanbeyan River,
 - Assessment of the ecological impacts due to the proposed modification to flows in Googong Creek. This is to examine both the proposed increases and reductions in flow.
 - Adequate mitigating measures and monitoring requirements for identified impacts.
- The additional assessment requirements for Googong Creek are highlighted due to the significant modifications proposed to the flow regime. These modifications are characterised by the complete loss of flows in summer and a significant increase in flows in winter/spring. Table 1 details the modelled impact from current modelled flows based on the information in Table 7.8 of Volume 1 of the EA.

Table 1.

% Flows	Summer	Autumn	Winter	Spring
50 th percentile	100% reduction	61% reduction	36% increase	45% reduction
80 th percentile	99% reduction	51% reduction	52% increase	82% increase

Queanbeyan River

- Due to the proposed modifications to flows within Googong Creek it is critical to assess the potential impact on the Queanbeyan River in terms of both the flow regime and the ecological response. Table 7.9 of the EA provides a broad indication of potential flow impacts for 50th percentile flows however the Office requests an assessment of the impacts for a range of percentile flows and the associated ecological impact.
- Where an impact has been identified, appropriate mitigating, monitoring and contingency measures will need to be outlined.

Montgomery Creek

- Consideration of the impacts to the flow regime and ecology of Montgomery Creek have not been addressed within the EA. Confirmation is requested as to why this is the case in consideration of the concept plan status and overall proposed assessment of the Googong Township development.

WATER LICENSING

- The environmental assessment has not considered the existence of and potential impact to any water users who may extract water from Googong Creek or the Queanbeyan River. The Office requests the proponent identify and assess the impact of the proposed flow modifications to any licensed water users and users with basic rights access to Googong Creek or the Queanbeyan River.
- Where an impact has been identified to an existing water user it will be necessary to outline appropriate mitigating, monitoring and contingency measures.

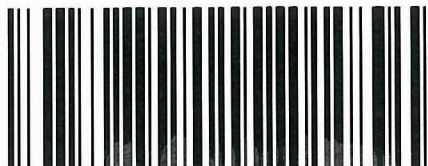
GROUNDWATER ASSESSMENT

- The Office recognises that the groundwater assessment has identified the project will result in a significant lowering of the watertable beneath the site due to reduced recharge potential and resultant impacts to baseflow discharges and groundwater users. These impacts have not been quantified in the EA and are proposed to be considered further through additional assessment. The Office supports the recommendations in Table E1 of Appendix E however would like to highlight the risk associated with delaying this assessment to after a determination by Department of Planning. The risk is associated with unconfirmed impacts to groundwater users and baseflow supplies hence it is yet to be determined whether these impacts are acceptable and whether they can be adequately mitigated.

**End of Attachment
6 January 2011**



Planning



PCU016795

Contact: Katrina Stankowski
Phone: 02 98738569
Email: Katrina.Stankowski@planning.nsw.gov.au
Our ref: N/A
Your ref: MP 08_0236
File: 10/22765

Ms Lisa Mitchell
Manager – Water Projects
Infrastructure Projects
Department of Planning
GPO Box 39
SYDNEY NSW 2001



Attention: Swati Sharma

Dear Ms Mitchell

RE: Heritage Branch comments on Exhibition of Environmental Assessment for Googong Water Cycle Project (08_0236).

Thank you for your Memorandum dated 10th November requesting any comments that the Heritage Branch may have on the Environmental Assessment for Googong Water Cycle Project (MP 08_0236) currently on public exhibition.

It is noted that this is the first time the Heritage Branch has been asked to provide comments on this project, although the Heritage Branch has been in contact and issued Approvals under the Heritage Act to CIC Australia regarding the excavation and management of GH14 site detailed within Appendix G of the EA.

The Heritage Branch has reviewed the four volumes of the report submitted- '*Googong Township water cycle project Environmental Assessment*' Volume 1 (Main Report) and Volume 2, 3 & 4 (Appendices) by Mandis Roberts, dated 11 November 2010, and has the following comments:

- Chapter 12 (Heritage) of the EA contains insufficient detail to assess the impacts the project will have on non-Indigenous heritage sites within the project area. For example, Section 12.4.2 states that "*surveys have been conducted to determine the number of non-indigenous heritage sites within the study area. Three previously recorded non-indigenous heritage sites are located within the subject site*". However, no description or detail of these three sites has been included. These sites are not referred to again in Chapter 12.
- Table 12.1 details the Indigenous and non-indigenous heritage features that could be affected by Stage 1 of the Project. However, as far as can be determined, no non-indigenous heritage items are listed in the Table. A note has been included which states that no non-indigenous heritage sites are within close proximity to infrastructure associated with Stage 1 of the project. However, the first line of Section 12.6.1 states that "The main impact relevant to non-indigenous and indigenous heritage sites is the potential to disturb identified sites during construction". Accordingly, the Heritage

Branch requests clarification on whether there are impacts to non-indigenous heritage or are there not.

- The lack of sufficient detail regrading non-indigenous heritage provided in the EA has meant that Appendix G 'Googong New Town Trunk Water and Recycled Water System Aboriginal and Historical Archaeological Assessment' by Navin Officer Heritage Consultants (dated October 2009), has had to be relied upon for all information regarding this topic. It is considered that this report is adequate regarding the detail and mitigation measures provided for the management of non-indigenous heritage. The Heritage Branch does recommend that some of the information contained within Appendix G should be included in Chapter 12 of the EA to address the issue raised under point 1 and 2
- The Heritage Branch generally agrees with the three draft Statement of Commitments put forward by the Applicant. However, the Heritage Branch requests that draft commitment NH3 is amended to reflect current legislative requirements set out in Section 146 of the NSW Heritage Act regarding the notification to the NSW Heritage Council of discovery of any 'Relics', which it is noted, is not turned off by the Part 3A process.

I hope that this information is of assistance. If you have any further enquiries regarding this matter, please contact Katrina Stankowski at the Heritage Branch on (02) 98738569.

Yours sincerely



17/11/2010

Vincent Sicari
Manager
Conservation Team
Heritage Branch
Department of Planning

A. J. and D. Dempster's response to the sewage treatment development application for Googong, December 2010.

We are objecting to the deposition of sewage recycling liquid from the proposed Googong town into the Queanbeyan River, which we use for our household water, without adequate compensation to the loss of our long standing amenity, good river water. We have used it since 1976 for cooking, washing dishes, bathing and brushing teeth with no ill effects. We have hosted local, interstate and international visitors from babies to adults with no ill effects to them. While the developer and perhaps the Dept. of Health say that the output of the sewage plant is cleaner than the river water there is an overwhelming psychological concern that this is not so.

We understood from the initial consultations in 2008 that osmosis filtration with the ability to filter out pharmaceuticals, etc., would be used in the sewage plant. We appreciate that dealing with the salt output from that would present great problems. However the proposed downgrading of the system using a relatively coarse membrane, chlorination and u/v treatment will leave a huge quantity of medical chemical problems in our water supply. This will cause serious health problems to the residents who have riparian rights. There is hard evidence that medications in sewage alter the ? of aquatic creatures downstream.

Any developer who wishes to build infrastructure that impinges detrimentally on long established residents, pre 1968, should seek to amicably determine with the residents a satisfactory outcome. There is an established system in the UK that if developers affect the status quo in order to make money , they should pay to satisfactorily rectify the problem. The relevant NSW Government Departments should support these viewpoints and best practices. Here are two possible solutions;

1 Supply potable water to Wickerslack Lane

2 Instal a 20,000 gallon watertank, pump, guttering, piping, etc for a gravity fed rainwater system to the thirteen houses where necessary as a minimum. Since there are a range of plumbing systems in use negotiations with each householder would be sensible.

For 161 Wickerslack Lane new guttering, a pump and switching gear to send water from the small tank at the house to a 20,000 tank uphill and back would be the least requirement. The guttering while adequate for the present small tanks spill too much water in heavy rain. Any agreements should apply to the house, not specifically to the present residents as the houses may change ownership.

The normal outflow and environmental releases from Googong Dam should continue. This will help to dilute the input from Googong town. Protocols should be in place to have extra water released from the dam when sewage plant breakdowns occur that cause partially treated sewage to be sent to the river. Wickerslack residents and relevant authorities should be warned of such events.

The developer has partially dealt with the stormwater. However it has not dealt adequately with the effect of releasing stormwater on the amount of bank erosion in Googong Ck or the on the badly constructed dams. Two dams have been over topped and in their normal state have insufficient height from top water level to the top of the damwall, it should be 1 metre minimum. The spillways are inadequate for the catchment. When those dams were being built we suffered dirty river water for some considerable time. The developer has talked to the landholder but not about stabilising the silt deposits at the river. The Department should ensure that there is a DA to specifically deal with stormwater and soil erosion.

D. and A. J. Dempster,
161 Wickerslack Lane,
Googong, 2620, NSW
62975608
daviddempster161@live.com

Submission to NSW Department of Planning: Part 3A Statement for Googong Sewerage System

Background

This is submitted by Roger and Elizabeth Clement who have lived at 155 Wickerslack Lane since 1973 and continue to exercise their riparian right to water from the Queanbeyan River for all household and garden needs except for water for drinking, cooking and teeth cleaning for which rainwater is used. We are one of around thirteen families along the eastern side of Wickerslack Lane whose lands front onto the river which is used to meet their everyday water needs. All fifteen families are located about 1 km downstream from the junction of Googong Creek and the Queanbeyan River.

The developer informed residents at a meeting on Monday 13 December in Queanbeyan that their preferred option would have been to return excess recycled water (i.e. the output from sewerage treatment) to Googong Dam from whence it came because the water qualities were similar. However this had been rejected by the NSW and ACT authorities. Thus the excess recycled water and any sewerage spillage from the sewerage works would now flow down Googong Creek and into the Queanbeyan River.

They also admitted that additional storm water (compared with the speed and volume of flows from the same land when used for agriculture) would also be flowing down Googong Creek because of the hard surfaces in the Googong Town. They agreed that in total this additional recycled water and storm water flows down Googong Creek would prove to be a significant increase but could offer no modelling or analysis to identify the likely impact.

Principle Objections and Recommendations

It is our firm view that the analysis provided in the present part 3A documentation is so deficient that it should be withdrawn, the papers rewritten to take account of the further analysis of all the major risks involved, and resubmitted for further public comment.

The risks not properly taken into account are firstly the risk of a major sewerage spillage from Googong treatment plant, the consequent damage this would do to the ecology and landforms in Googong Creek, the ecology of Queanbeyan River downstream from its junction with Googong Creek all the way to Lake Burly Griffin and the economy and amenity for the people of Queanbeyan and Canberra.

The second major risk is due to the insidious effects of the additional flows of recycled water and storm water arising from Googong Township down Googong Creek. The developer acknowledges that these additional will be significant and makes a lame offer of remediation if required without undertaking any analysis of the size frequency and distribution of such flows. Local storm patterns and maximum precipitation events are likely to make this situation even more fraught. The very steep and narrow nature of Googong Creek and the poor construction standard of the existing dams, make it very difficult if not impossible to

undertake remediation after the event. Just getting machinery into and out of the creek may well do even more damage than has already occurred.

These two risks are elaborated on below together with further recommendations in the event of the proposed sewerage treatment plant proceeding.

The High Risk of a Serious Sewerage Spill

In support of this conclusion we offer the following observations on the likelihood of such a spill occurring risks:

- . The sewerage treatment plant and the sewerage pumping points need substantial amounts of electric power to operate which power is subject to major interruptions lasting substantially longer than the four hours bypass storage of the sewerage plant. The causes of this power outage could include either a major bushfire destroying the several poles of the major supply to Googong township or major lightning strike doing major damage to the substation or switching yards supplying Googong township. Power cuts in such circumstances are often for 24 hours or more.
- . In the event of a major rain event such as a one in 20 year flood or a shorter maximum precipitation event the storm water systems of Googong township and their back- up over ground flows along streets will be overwhelmed, allowing major ingress of storm water into the sewerage system with resulting major overflows beyond the four hour bi-pass capacity of the sewerage plant.
 - Such rain events will occur and their risk is increased by an identified local storm condition which applies to storm cells in Queanbeyan and Canberra region, and their storm paths bringing them into contact with uplifting terrain adjacent to hills and ridges. Such a storm drowned 7 people in Canberra in the Woden Valley in the 1970s when it dropped very heavy rain on Mt Taylor. More recently in the 1980s a storm which came down the Queanbeyan River Valley and over the slopes of Mt Jerrabomberra dumped 68mm of rain in less than 40 minutes causing major flooding of houses in southern Queanbeyan and overwhelming both the storm water system and its over ground backup. It quickly filled and overflowed a detention basin at South Queanbeyan Primary School which Queanbeyan Council claimed at the time had been built to contain a one in one hundred year rainfall event.
 - The Googong township will sit on top of a ridge well elevated above the Queanbeyan River and is therefore subject to major uplift of storms passing down the Queanbeyan River storm path (typically south to north).
- . To the above scenarios must be added major human error causing the plant to overflow significantly. Queanbeyan Council has poor record in this regard with three major sewerage spills in the past ten years with two related to human error.
- . Also of major concern over time is the ability of any local government authority in Australia to control the turning of storm water into sewerage system. Every sewerage

plant in Canberra and Queanbeyan overflowed in the flood events of the past three weeks in the region. All of these flood events were between one in five and one in ten year events and the sewerage overflows were in part at least due to substantial; infiltration of the sewerage system by storm water. The record of Councils elsewhere in Sydney and right across the eastern states is universally poor in this regard.

. Finally on this we can say with certainty that over the life of the proposed sewerage system, the likelihood of occurrence of major flood and fire events and their intensity will increase substantially due to climate change.

Conclusion about likelihood of a major sewerage spillage

The above evidence naturally leads to the conservative conclusion that over the first ten years from commissioning, the likelihood is close to one of a major sewerage spill from this sewerage works with major impacts on the ecology, economy and amenity of Queanbeyan River and its users. Further we can say with certainty that this likelihood will increase further over the life of the plant due to increasing levels of storm water inflow to the system and because climate change will make extreme fire and rain events more likely.

The Impact On the Ecology and Sediments in Googong Creek

The papers basically dismiss the risk of serious damage to Googong Creek and the Queanbeyan River from consequential sedimentation due to increased run-off from the hard surfaces of Googong township and the need to dispose of surplus recycled water. It almost certainly underestimates the impact of major rain events and maximum precipitation events both now and into the future. The evidence of storm paths down the Queanbeyan River valley and unusually heavy rainfalls over a short period are substantial. For example the major rainfall events recorded on the lower slopes of Mt Jerrabomberra which is less than 4 kms from the Googong site. In fact Mt Jerrabomberra forms the northern end of the ridge on which Googong township will sit. The tragic loss of seven lives in the Woden incident in the 1970s was avoidable because the local farmer warned ACT authorities he had seen such floods twice in the previous fifty years but they took no action to address these maximum flows off Mt Taylor which were exacerbated by the hard surfaces of the new suburbs in the Woden area.

There needs to be careful estimates made of the increase in volumes due to runoff from hard surfaces and the additional recycled water. This then needs to be carefully modelled for a range of scenarios to identify the impact on Googong Creek and the likely movement of sediments and the flow on effects for the Queanbeyan River. If, as seems likely, there are major sediments movements projected then serious amelioration proposals need to be identified and implemented before the township is built because as already explained the chances of being able to do anything about the problems once they have happened will be

likely to be highly constrained due to the terrain of Googong Creek and its narrow steep gorge structure.

Additional Recommendations If the Decision is taken to Proceed Immediately

- 1 There needs to be an immediate effort made to reach agreement with the ACT Government to allow the operators at Googong Dam to immediately release additional water into the Queanbeyan River from the dam to substantially dilute the impact of any sewerage or chemical spill into the River from Googong township. The agreement must be in place before the sewerage system at Googong is commissioned.**
- 2 There should be weekly full monitoring in both the exit of Googong Creek into the Queanbeyan River and in the river itself just below the junction of Googong Creek and the River with the results published on line within hours of them being completed. This full testing regime should extend to the Wickerslack sampling site and also to the sites in Queanbeyan.**
- 3 Queanbeyan Council should be responsible for immediately notifying the Wickerslack residents relying on this water and Queanbeyan and Canberra residents if there any elevated levels of readings from the river above prescribed human health guidelines.**
- 4 The QCC should move immediately to make the developer contribute to a scheme for the reticulation of potable water or 20,000 gallon rainwater tanks pumps and roof guttering in Wickerslack Lane at no additional capital cost to these residents.**

List of abbreviations

Abbreviation	Definition
ACTEW Corporation	Australian Capital Territory Energy and Water Corporation
AEC	Areas of environmental concern
ANZECC	Australian and New Zealand Environment Conservation Council
AS	Australian standard
BC	Brown Consulting
BNAC	The Buru Ngunawal Aboriginal Corporation
BNR	Biological nutrient removal
BOD	Biological oxygen demand
BoM	Bureau of Meteorology
BWPS	Bulk water pumping station
CBLDA	Consultative Body on Land Development and Artefacts
CEMP	Construction environmental management plan
CIC	CIC Australia
CMJA	C. M. Jewell & Associates
COD	Chemical oxygen demand
DA	Development application
DECCEW	ACT Department of Environment, Climate Change, Energy and Water
DECCW	NSW Department of Environment, Climate Change and Water, now OEH
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts, now DSEWPAC
DGR's	Director General Requirements
DO	Dissolved oxygen
DoP	NSW Department of Planning, now DPI
DPI	NSW Department of Planning and Infrastructure, former DoP
DSEWPAC	Commonwealth Department of Sustainability, Environment, Water Population and Communities (formerly DEWHA)
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services, former I&I NSW
DWE	NSW Department of Water and Energy, now NOW
EC	Elton Consulting
EA	Environmental assessment
ECRTN	Environmental Criteria for Road Traffic Noise

Abbreviation	Definition
EEC	Endangered ecological communities
EIS	Environmental impact statement
EM	Electromagnetic
ENCM	Environmental Noise Control Manual
EP	Equivalent population
EPI	Environmental planning instrument
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ESD	Ecologically sustainable development
GDA	Googong Dam Area
GDE	Groundwater-dependent ecosystems
GSAHS	Greater Southern Area Health Service
HLZ	High-level zone
I & I NSW	Industry and Investment NSW, now DTIRIS
INP	Industrial Noise Policy
IPART	Independent Pricing and Regulatory Tribunal
IWC	Integrated water cycle
IWCMS	Integrated water cycle management strategy
L	Litre
LAeq	Equivalent continuous noise level
LEP	Local Environmental Plan
LES	Local Environmental Study
LoS	Level of Service
m	Metre
m ²	Square metre
MBR	Membrane bioreactor
ML	Megalitre
MoU	Memoranda of understanding
MR	Manidis Roberts
MSDS	Material safety data sheet
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NES	National environmental significance
NH ₄	Ammonium
NH1A	Neighbourhood 1A
NLALC	Ngunnawal Local Aboriginal Land Council

Abbreviation	Definition
NSW	New South Wales
NTU	Turbidity
NOW	NSW Office of Water, former DWE
NOx	Oxides of nitrogen
O/E ratio	Observed and expected ratio
OEHS	NSW Office of Environment and Heritage, former DECCW
OEMP	Operational environmental management plan
ou	Odour units
PAC	Planning Assessment Commission
PAD	Potential archaeological deposits
PC	Palerang Council
PEA	Preliminary environmental assessment
PoEO Act	<i>Protection of the Environment Operations Act 1997</i>
PER	Public environment report
PFM	Planning focus meeting
PHA	Preliminary hazard analysis
PLC	Program logic controller
PPR	Preferred project report
PSNL	Project specific noise level
QCC	Queanbeyan City Council
REP	Regional Environmental Plan
RTA	NSW Roads and Traffic Authority, now Department of Transport – Roads and Traffic Authority
RWRMP	Recycled Water Risk Management Plan
SCADA	Supervisory Control and Data Acquisition
SEPP	State Environmental Planning Policy
SoCs	Statement of commitments
SPS	Sewage pumping station
STP	Sewage treatment plant
TDS	Total dissolved solids
TN	Total nitrogen
TNE	Traditional Ngarigo Elders
TP	Total phosphorous
TSR	Travelling stock reserves
TSS	Total suspended solids

Abbreviation	Definition
UV	Ultraviolet
VIA	Visual impact assessment
VPA	Voluntary Planning Agreement
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WRP	Water recycling plant
WSA	Title prefix for codes developed by Water Services Association
WSAA	Water Services Association of Australia
WSUD	Water-sensitive urban design
WTP	Water treatment plant

Notes:

- This table includes abbreviations from the EA, so not all are mentioned in this report.